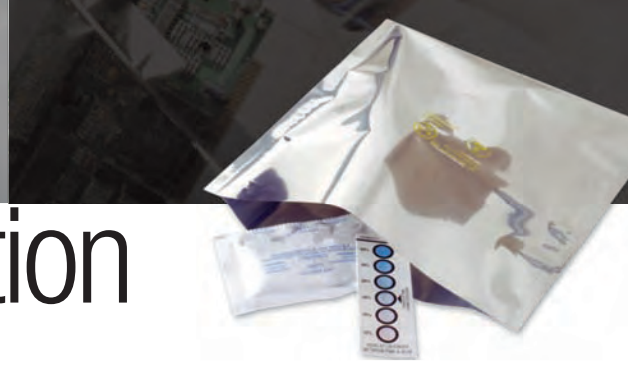
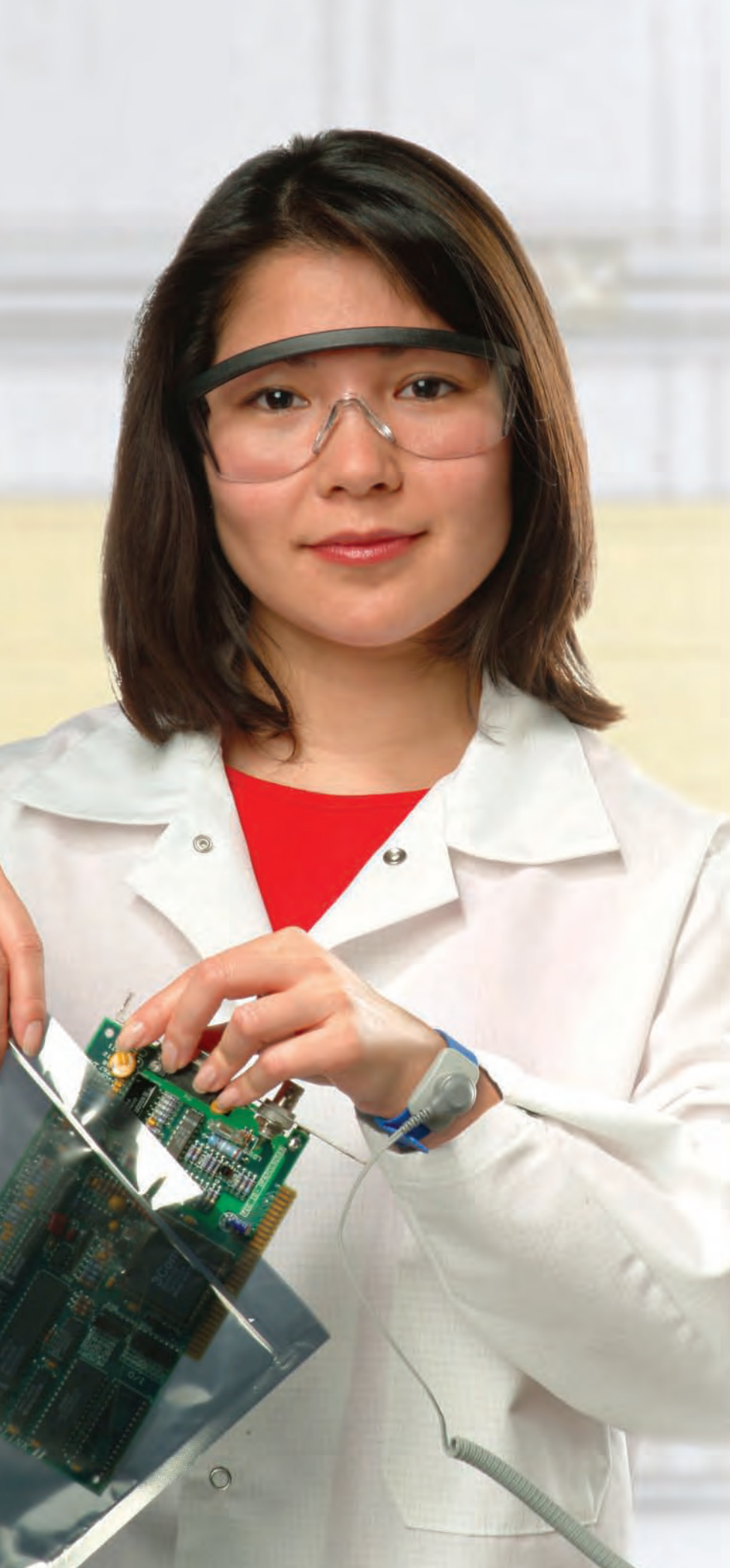
3M Electronic Solutions Division
Static Control Products and Services Catalog



Innovations in Static Protection

3M



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 every day in many markets, including electronics, industrial, automotive, medical and consumer.

The Experts in Static Control.

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

It's a Matter of Control.

A full range of products. Full-service solutions.

The Need for Complete Static Control Solutions

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 and accurately provide a static control solution uniquely suited to meet your needs. 3M is your single source for fast, customized solutions virtually 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, short lead times on make-to-order products, electronic funds transfer, Web PO, EDI, extranet services for key customers, on-site training, EOS/ESD assessments and more.

Enabling you to better manage your ESD environment.

ANSI/ESD S20.20 ESD Control Program

There is a single, internationally recognized, comprehensive program for static control. This program can be tailored to fit your applications, but still keep you aligned with most major electronics OEMs and contract manufacturers.

The ESD Association (ESDA) developed the ANSI/ESD S20.20 ESD Standard for the Development of an Electrostatic Discharge Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment. This program has seen rapid adoption by OEMs, contract manufacturers, military and government agencies, and military suppliers as the single consistent methodology for implementing an ESD control program.

Like ISO9000, your facility can be compliance certified to S20.20 by an ISO registrar. By adopting this recognized ESD program, contract manufacturers can avoid the expense of complying with multiple customer programs. OEMs can look to contract manufacturers with S20.20 programs and be assured of proper ESD safeguards.

Technical Requirements Summary

Grounding
All the items in a protected area need to be bonded to ground. Ground cords provide the proper low resistance path to a common grounding point.

Personnel Grounding
People handling ESD sensitive items must be bonded to ground. Wrist straps provide the proper connection between a person and a common grounding point. Foot grounders and flooring can also be used. However, wrist straps must be used when the person is seated.

Protected Area
A protected area must be defined by signs, and have the materials necessary to connect all the ESD sensitive items, people and equipment to ground. Charged insulators (like common plastics) must be controlled. Signs, mats, sheet protectors, antistat, lotion, aisle marking tape and ionizers make this possible.

Packaging
ESD sensitive items must be placed in ESD protective packaging while not in a protected area. Static shielding and moisture barrier bags are ESD shielding, field shielding and low charging. Use labels, HICs, desiccant and sealers to complete the package. Carriers, containers and cushion wrap keep items safe.

Compliance Verification (Auditing and Monitoring)
The effectiveness of the program must be verified by audits. Personnel grounding devices (wrist straps and foot grounders) must be tested on a regular basis and monitored. Ground monitors, resistance checkers and discharge detectors allow proper audits.

3M Products are ESD 20.20 Program Compliant

Build your S20.20 program with innovative static control from 3M.

3M Products are ESD 20.20 Program Compliant

Measure

Find the source and the amount of EOS and ESD in the factory using 3M instrumentation.

Build

Create the ESD protected area (EPA) by using 3M workstation products that address the amount of EOS and ESD and the sensitivity of your products.

Protect

Keep parts and finished product static safe inside and outside the EPA with 3M packaging products.

Verify

Confirm that your 20.20 program and protective products are working by using 3M monitors, testers and instruments.

Contents

Packaging . . . . . 1 - 25

Static Shielding Bags Product Selection Guide 2
Static Shielding Bags . . . . . 3 - 6
Labels, Destructible 7
Labels, Reusable 8
ZipTop Reclosable Static Shielding Bags 9
How To Dry Pack per Standard JEDEC 033 10

Moisture Barrier Bags Product Selection Guide . . . . . 11 - 12
Moisture Barrier Bags . . . . . 13 - 16
Humidity Indicator Cards (HICs) 17
Desiccants 17
Dry Packaging Labels 18
Vacuum Sealers 18
Cushioned Shielding Bags, Wrap 19
Moisture Barrier Bags for Military 20
Conductive Bags, Drum Liners 21
Conductive Film, Tubing 22
Conductive Containers . . . . . 23 - 24
Connector Covers 25

Workstation Products . . . . . 26 - 57

Wrist Strap Product Selection Guide 26
Wrist Straps (Single and Dual Wire) . . . . . 27 - 32
Wrist Strap Ground Cords 30, 31

Heel/Foot Grounder Product Selection Guide 33
Sole Grounders 34
Heel Grounders . . . . . 35 - 39
Toe Grounders 39

Mat Product Selection Guide 40
Mats and Rolls . . . . . 41 - 46
Dissipative Hard Laminate Sheets 47
Dissipative Rigid Worksurfaces 47
Clean Walk Mats 48

Ground Cord Product Selection Guide 48
Grounding Accessories . . . . . 49 - 50

Worksurface Cleaning Products 52
Field Service Kits . . . . . 53 - 54
Signs 55
Vacuums, Filters 56
Vacuum Accessories 57

Instrumentation . . . . . 59 - 88

Diagnostic Equipment . . . . . 59 - 67
EM Aware TNG ESD Event Monitor, Starter Kits . . . . . 59 - 60
EM Eye Meters . . . . . 61 - 62
ESD Pro ESD Event Indicators 63
Ground Pro Ground Integrity Meters 63
Charge Analyzers/Charge Plate Monitors, Properties 64

Contents

Air Ionizer Testers/Field Meter and Chargers . . . 65
Air Ionizer Test Kits . . . 65
Test Kits for Static Control Surfaces . . . 66
Surface Resistance Meters . . . 67

Testers . . . 67 - 70
Data Logging Software . . . 67
Shoe/Wrist Strap Testers . . . 68
Wrist Strap and Footwear Testers . . . 69
Wrist Strap Testers . . . 70

Monitors . . . 72 - 82
WS Aware Dual Workstation Monitors . . . 72
Iron Man Workstation Monitors . . . 73
How to Manage Electrical Overstress (EOS) . . . 74
Workstation Monitors . . . 75
Dual Conductor Remote Input Jacks . . . 75
Dual Conductor Portable Wrist Strap Monitors . . . 76
Static Monitors . . . 77
Monitor Verification Kits . . . 78
Workstation Monitor Checkers . . . 78
Single Wire Continuous Monitors . . . 79
Ground Master Equipment Ground Monitors . . . 80
Ground Man and Ground Man Plus Ground Monitors . . . 81
Wrist Strap and Ground Monitors . . . 82
Importance of Grounding . . . 82

Air Ionizers . . . 83 - 88
Air Ionizers . . . 83 - 86
Equilibrion Ionization Controllers and Monitors . . . 87
Instrumentation Accessories . . . 88

Flooring . . . 90 - 91

Tapes . . . 92 - 94
Antistatic Tapes/Dispensers . . . 92
Adhesive Tapes . . . 93 - 94

Training . . . 96

Ordering and International Information . . . 97 - 98

Product Name Index . . . 99 - 102

Product Number Index . . . 103 - 106

Alpha Product Number Index . . . 107 - 108

Packaging

Packaging Protection You Can Trust

3M provides static control packaging to protect electronic items from electrostatic, physical and environmental damage during manufacture, transportation and storage. 3M packaging can help you build a compliant ANSI/ESD S20.20 static control program. S20.20 now refers to ANSI/ESD S541 to set the performance goals for packaging.

S541 Requirements for Protective Packaging

1. Low charge generation
2. Dissipative or conductive materials for intimate contact
3. A structure that provides electrostatic discharge shielding

Following the Road Map to More Packaging Protection

The 2005 ESD Association Technology Road Map shows that, because of the continued reduction in device size, chips will become more sensitive to static though 2010, reaching sensitivity levels not observed since 1980. Also, the Industry Council on ESD has proposed that on-chip protection levels be lowered by half to save space on devices and increase speed. As sensitivity climbs, and on-chip protection falls, robust ESD protective packaging will be even more critical.

Choose the Protection That You Need

From the following pages, choose the packaging that fits your application, or contact 3M for application guidance.

3M™ Static Shielding Bag

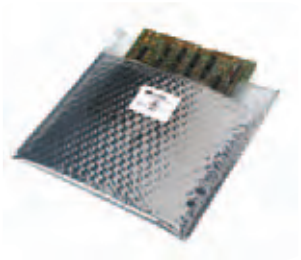
3M™ Static Shielding Bags

Static Shielding Bags are tested to comply with ESDA, industry and customer standards. Cost effective metal-in shielding bags and high protection metal-out shielding bags allow you to meet protection requirements for a wide range of device sensitivities.

3M™ Moisture Barrier Bag

3M™ Moisture Barrier Bags

Moisture Barrier Bags are tested to comply with ESDA, JEDEC and customer standards. Protection from moisture and static damage allows you to meet dry packaging requirements.



3M™ Cushioned Static Shielding Bag 2120R

3M™ Single Device Carrier

Physical Protection

Conductive containers, carriers and cushioned bags protect your valuable products from both physical and static damage.

RoHS Compliant 2002/95/EC

3M Products are ESD 20.20 Program Compliant

3M™ Static Shielding Bag with RoHS Label

3M™ Static Shielding Bags

3M is one of the leading manufacturers of static shielding bags, offering fast shipment from large inventories of standard sized bags, and custom bag sizes to fit your application. Bags are marked with ESD caution information, RoHS compliant symbols, and are lot coded for traceability. Custom printing is available.

Static Shielding bags protect electronic items from electrostatic, physical and environmental damage during manufacture, transportation, and storage. As required in ANSI/ESD S541, and as part of the ANSI/ESD S20.20 ESD control program, shielding bags provide protection from static discharge and are low charging. These bags are one of the most cost effective and widely used types of static control packaging, with over 500 million bags made each year.

See page 7-8 for labels and sealers to close static shielding bags.
See the product data sheets online, or call 3M for information about custom bags.

3M™ Static Shielding Bags Product Selection Guide

Product	Technology	Benefit	Application	Page
Metal-In Shielding Bag				
SCC 1000	Metal-In Static Shielding Bag	Four-layer construction. Polyester dielectric and metal layer provide Faraday effect shielding of ESD and fields. Tribocharging is minimized by the specially processed polyethylene. Lot coded for QC traceability.	Transparent, metallized static shielding bag provides a static safe environment for sensitive electronic devices.	pg. 3
Metal-Out Shielding Bag				
SCC 1500	Metal-Out Static Shielding Bag	Provides low charge retention and rapid static decay. These bags are approved by major computer, electronics, and disk drive manufacturers for use worldwide. Lot coded for QC traceability.	Best protection from ESD through low charge retention and rapid static decay.	pg. 5
ZipTop Reclosable Bags				
SCC 1000 **SCC 1300** **SCC 1500** **2110R**	Reclosable ZipTop Static Shielding Bag	ZipTop feature makes the bag easy to open and close. Lot coded for QC traceability.	Easy to open and close. Transparent, metallized static shielding bags provide a static safe environment for sensitive electronic devices.	pg. 9 pg. 9 pg. 9 pg. 9
Puncture Resistant Shielding Bags				
SCC 1300	Puncture Resistant Metal-In Static Shielding Bag	High puncture resistance provides a long life and reduces tears. Four-layer construction. Polyester dielectric and metal layer provide Faraday effect shielding of ESD and fields. Lot coded for QC traceability.	For tubes and heavy items. Transparent, metallized static shielding bag provides a static safe environment for sensitive electronic devices.	pg. 6
2100R	Puncture Resistant Metal-Out Static Shielding Bag	High puncture resistance provides long life and reduces tears. Metallized bag structure provides a static safe environment for sensitive electronic devices. Provides low charge retention and rapid static decay. Lot coded for QC traceability.	For tubes and heavy items. Best protection from ESD through low charge retention and rapid static decay.	pg. 6

Packaging

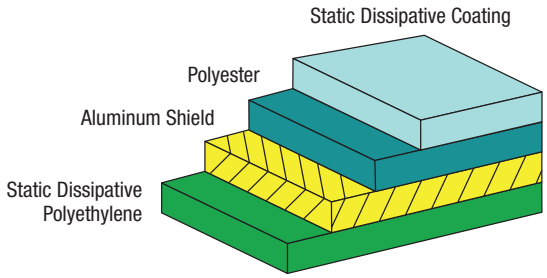
3M™ Static Shielding Bag SCC 1000

3M™ Metal-In Static Shielding Bags SCC 1000

This transparent, metal-in static shielding bag is designed to provide a static safe environment for sensitive electronic devices. With more than 100 stock sizes ready for same-day shipping, the 3M SCC 1000 remains the bag of choice for IC and PCB protection. These bags are tested to meet or exceed the electrical and physical requirements of MIL-PRF-81705 Type III, ANSI/ESD S541, EIA 625, MIL-HDBK-263, MIL-STD-1686, and ANSI/ESD S20.20. Bags are RoHS Compliant* and lead-free**.

Features

- Faraday effect shielding by the metallized layer protects electronic devices from ESD and electrostatic fields.
- Durability is enhanced by positioning the metal layer between polyester and polyethylene.
- Four-layer construction offers excellent protection from punctures and tears.
- Bags are printed with ESD Warning symbol and lot coded for QC traceability.
- Testable to industry standards.



See the full product data sheet, or Technical Bulletin "Choosing the Right Static Bag" online.

Close bags with 3M™ ESD Warning labels.
See page 55.

Related Products

ZipTop Reclosable Static Shielding Bags . . . . . pg. 9

RoHS Compliant 2002/95/EC

3M Products are ESD 20.20 Program Compliant

3M Standard Size (Inside Dimensions)

3M™ Static Shielding Bags, Open Top SCC 1000					
W x L (in.)	*Part No.*	*W x L (in.)*	*Part No.*	*W x L (in.)*	*Part No.*
2 x 3	10023	6 x 30	100630	12 x 12	1001212
2 x 4	10024	6.5 x 10	1006.510	12 x 14	1001214
2 x 6	10026	6.5 x 16	1006.516	12 x 16	1001216
3 x 3	10033	7 x 10	100710	12 x 18	1001218
3 x 5	10035	7 x 11	100711	12 x 24	1001224
4 x 4	10044	7 x 15	100715	12 x 25	1001225
4 x 6	10046	7 x 16	100716	12 x 30	1001230
4 x 8	10048	8 x 8	10088	14 x 18	1001418
4 x 24	100424	8 x 10	100810	14 x 20	1001420
4 x 26	100426	8 x 12	100812	14 x 30	1001430
4 x 30	100430	8 x 18	100818	15 x 18	1001518
5 x 6	10056	8 x 24	100824	16 x 18	1001618
5 x 7	10057	8 x 30	100830	16 x 20	1001620
5 x 8	10058	9 x 12	100912	16 x 24	1001624
5 x 10	100510	10 x 12	1001012	18 x 18	1001818
6 x 8	10068	10 x 14	1001014	18 x 20	1001820
6 x 9	10069	10 x 16	1001016	18 x 24	1001824
6 x 10	100610	10 x 18	1001018	18 x 30	1001830
6 x 12	100612	10 x 24	1001024	20 x 20	1002020
6 x 14	100614	10 x 26	1001026	20 x 24	1002024
6 x 16	100616	10 x 30	1001030	22 x 24	1002224
6 x 18	100618	11 x 14	1001114	24 x 24	1002424
6 x 24	100624	11 x 15	1001115	24 x 30	1002430
6 x 26	100626			30 x 24	1003024
3M™ Static Shielding Bags, ZipTop SCC 1000					
2 x 3	30023	6 x 10	300610	10 x 30	3001030
3 x 3	30033	6 x 24	300624	11 x 15	3001115
3 x 4	30034	6 x 30	300630	12 x 12	3001212
3 x 5	30035	7 x 15	300715	12 x 16	3001216
4 x 4	30044	8 x 8	30088	12 x 18	3001218
4 x 6	30046	8 x 10	300810	14 x 18	3001418
4 x 8	30048	8 x 12	300812	15 x 18	3001518
4 x 24	300424	9 x 12	300912	16 x 24	3001624
4 x 30	300430	10 x 10	3001010	18 x 18	3001818
5 x 8	30058	10 x 12	3001012	18 x 24	3001824
5 x 10	300510	10 x 14	3001014	20 x 24	3002024
6 x 8	30068	10 x 24	3001024	24 x 24	3002424

- All standard sizes in stock/same day shipment.
- Width is measured from inside seam to inside seam.
- Length is measured from the top edge to the bottom fold.
- Opening is in the "width" dimension.
- Custom bag sizes, custom printing, and custom hot stamping are available.
- Most sizes are packed 100 per case.
- Small sizes are packed 500 or 1,000 per case.

SCC 1000 Bag Properties

Electrical Properties		
Surface Resistivity/Resistance		
	ASTM D257	**ANSI/ESD STM11.11**
Interior	$<10^{12}$ ohm/square	or $<10^{11}$ ohm
Exterior	$<10^{12}$ ohm/square	or $<10^{11}$ ohm
Metal	<100 ohm	
Static Shielding	<30 volts	MIL-PRF-81705, EIA 541
Static Shielding	<10 nJ	ANSI/ESD STM11.31, ANSI/ESD S541
Static Decay	<0.05 seconds	MIL-STD-3010
Charge Generation		
PTFE	0.09 nC/sq.in.	Modified Inclined Plane
Quartz	0.01 nC/sq.in.	
Physical Properties		
Tensile Strength	4700 PSI, 330 kg/cm^2	ASTM D882
Seam Strength	>10 lbs	ASTM D882
Light Transmission	40%	Tobias
Heat Sealing Conditions		
Temperature:	250°F – 375°F	
Time:	0.5 – 3.5 seconds	
Pressure:	30 – 70 PSI	
Thickness:	3.0 mils	
Cleanliness Properties		
Non-corrosive	Pass	MIL-STD-3010
Silicon or Amine Content	Not detected	FTIR

3M Products are ESD 20.20 Program Compliant

RoHS Compliant 2002/95/EC

3M™ Metal-Out Static Shielding Bags SCC 1500

3M™ Static Shielding Bag SCC 1500

The Static Shielding Bag SCC 1500 is engineered to provide low charge retention and rapid static decay. The proprietary top coating improves durability, making the bag superior to other metal-out bags. The technology has gained the bag approval by the most critical electronics and disk drive manufacturers. This transparent, metal-out, static shielding bag provides a static safe environment for sensitive electronic devices.

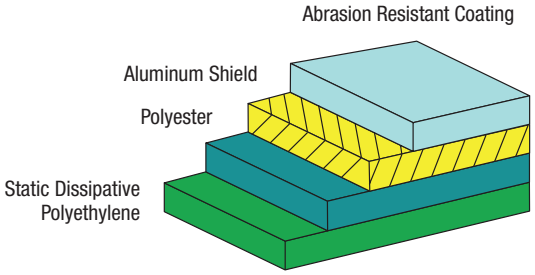
SCC 1500 bags are tested to meet or exceed the electrical and physical requirements of MIL-PRF-81705 Type III, ANSI/ESD S541, EIA 625, MIL-HDBK-263, MIL-STD-1686, ANSI/ESD S20.20, and charge retention standards. Bags are RoHS Compliant* and lead-free**.

Features

- Faraday Cage effect shielding of the metallized layer protects electronic devices from ESD and electrostatic fields.
- Metal layer is positioned near the outer surface for fast charge decay and low charge retention.
- Four layer construction offers excellent protection from punctures and tears.
- Bags are printed with ESD Warning symbol and lot coded for QC traceability.
- Testable to industry standards.
- Specially processed polyethylene minimizes tribocharging.

SCC 1500 Bag Properties

Electrical Properties		
Surface Resistivity/Resistance		
	ASTM D257	**ANSI/ESD STM11.11**
Interior	$<10^{12}$ ohm/square	or $<10^{11}$ ohm
Exterior	$<10^{5}$ ohm/square	or $<10^{8}$ ohm
Metal	<100 ohm	
Static Shielding	<30 volts	MIL-PRF-81705, EIA 541
Static Shielding	<10 nJ	ANSI/ESD STM11.31, ANSI/ESD S541
Charge Retention	< 100 volts	
Physical Properties		
Tensile Strength	4700 PSI, 330 kg/ cm^2	ASTM D882
Seam Strength	>10 lbs	ASTM D882
Light Transmission	40%	Tobias
Heat Sealing Conditions		
Temperature:	250°F – 375°F	
Time:	0.5 – 3.5 seconds	
Pressure:	30 – 70 PSI	
Thickness:	3.0 mils	
Cleanliness Properties		
Non-corrosive	Pass	MIL-STD-3010
Silicon or Amine Content	Not detected	FTIR



Standard Size (Inside Dimensions)

SCC 1500 Open Top						SCC 1500 ZipTop	
W x L (in.)	*Part No.*	*W x L (in.)*	*Part No.*	*W x L (in.)*	*Part No.*	*W x L (in.)*	*Part No.*
3 x 5	15035	8 x 12	150812	12 x 18	1501218	3 x 5	150Z35
4 x 6	15046	9 x 12	150912	14 x 18	1501418	4 x 6	150Z46
5 x 8	15058	10 x 12	1501012	15 x 18	1501518	5 x 8	150Z58
6 x 8	15068	10 x 14	1501014	16 x 24	1501624	6 x 8	150Z68
6 x 10	150610	10 x 24	1501024	18 x 18	1501818	6 x 10	150Z610
6 x 30	150630	11 x 15	1501115	18 x 24	1501824	8 x 10	150Z810
7 x 15	150715	12 x 16	1501216			10 x 12	150Z1012

- All standard sizes in stock/same day shipment.
- Width is measured from inside seam to inside seam.
- Length is measured from the top edge to the bottom fold.
- Opening is in the "width" dimension.
- Custom bag sizes, custom printing, and custom hot stamping are available.
- Most sizes are packed 100 per case.
- Small sizes are packed 500 or 1,000 per case.

Related Products

ZipTop Reclosable Static Shielding Bags . . . . . pg. 9

3M™ Puncture Resistant Bags

Puncture resistant shielding bags offer more strength for packaging items with sharp edges, like PCBs and shipping tubes. These puncture resistant bags use double the amount of polyester plastic as compared to standard shielding bags. Please call for bag sizes.

3M™ Puncture Resistant Metal-In Static Shielding Bags SCC 1300

3M™ Puncture Resistant Metal-In Static Shielding Bag SCC 1300

Features

- Extra thick polyester plastic to resist punctures and tears.
- Faraday effect shielding of the metallized layer protects electronic devices from ESD and electrostatic fields.
- Bags are printed with ESD Warning symbol and lot coded for QC traceability.
- Tested to meet or exceed the electrical and physical requirements of MIL-PRF-81705 Type III, ANSI/ESD S541, EIA 625, MIL-HDBK-263, MIL-STD-1686, ANSI/ESD S20.20.
- Bags are RoHS Compliant* and lead-free**.

SCC 1300 Bag Properties

Physical Properties		
Puncture Resistance	>16 lbs.	FTMS 101 MTH 2065
Seam Strength	Pass	MIL-PRF-81705
Light Transmission	40%	Tobias
Thickness	3.2 mils	
Electrical Properties		
	ASTM D257	**ANSI ESDSTM11.11**
Surface Resistivity/Resistance		
Interior	$<10^{12}$ ohm/square	or $<10^{11}$ ohm
Exterior	$<10^{12}$ ohm/square	or $<10^{11}$ ohm
Metal	100 ohm	
Static Shielding	<30 volts	MIL-PRF-81705, EIA 541
Static Shielding	<10 nJ	EOS/ESD S11.31
Static Decay	<0.05 seconds	MIL-PRF-81705, FTMS 101 MTH 4046

3M™ Puncture Resistant Metal-Out Static Shielding Bags 2100R

3M™ Puncture Resistant Metal Out Static Shielding Bag 2100R

Features

- Extra thick polyester plastic to resist punctures and tears.
- Metal layer is positioned near the outer surface for fast charge decay and low charge retention.
- Bags are printed with ESD Warning symbol and lot coded for QC traceability.
- Tested to meet or exceed the electrical and physical requirements of MIL-PRF-81705 Type III, ANSI/ESD S541, EIA 625, MIL-HDBK-263, MIL-STD-1686, ANSI/ESD S20.20., and charge retention standards.
- Bags are RoHS Compliant* and lead-free**.

2100R/2110R Bag Properties

Property	Typical Value	Test Method
Thickness	3.2 mil (81 microns)	ASTM D2103
Strength	>20 lbs. (>6250 PSI, 4.3 x 107 N/m^2)	
Tensile	9000 PSI (6.2 x 107 N/m^2)	ASTM D882
Puncture	24 lbs. (10.9 kg)	FTMS 101
Seam	Pass	MIL PRF 81705
Optical Density	.35–.45	ASTM D1003
Surface Resistance/ Resistivity		
Interior	$<10^{11}$ ohm	ANSI/ESD S11.11
Exterior	$<10^{9}$ ohm	ANSI/ESD S11.11
Metallized Layer	$<10^{2}$ ohm/sq	Monroe #267
Electrostatic Shielding	<30V <25 nJ	EIA-541 (V-Zap) ANSI/ESD S11.31
Decay Time	<2 sec.	EIA-541
Contact Corrosivity	Pass	FTMS 101C Method 3005
Outgassing		
TML	<1.0%	ASTM E595
CVCM	<0.1%	ASTM E595
Heat Seal Properties		
Temperature	180°F – 250°F (82°C – 121°C)	
Time	0.5 – 5.0 sec.	
Pressure	20 – 60 PSI	
Shelf Life	1 Year	

3M Products are ESD 20.20 Program Compliant

RoHS Compliant 2002/95/EC

3M™ Labels, Destructible

Labels alert personnel handling bags, boxes or other carriers that the contents are static-sensitive. 3M labels are easy to use and provide the ESD symbol and warning message needed to complete your protective package. These destructible type labels are “tamper evident,” letting you easily monitor whether or not a bag has been opened.

3M™ Attention Labels

3M™ Attention Labels

Destructible, black printing on yellow background. This JEDEC-14 label displays the reaching hand symbol and provides writing space.

3M™ Attention Labels

Product No.	Description	Labels per Roll
7102	Destructible Yellow w/ Black Type. Room to write. JEDEC-14 Symbol Size: 1.875 in. x 2.5 in. (4.8 cm x 6.4 cm)	500
ALABEL	Destructible Yellow w/ Black Type. Room to write. JEDEC-14 Symbol Size: 1.875 in. x 2.5 in. (4.8 cm x 6.4 cm)	500
ALABEL5/8X2	Destructible Yellow w/ Black Type. JEDEC-14 Symbol Size: 0.625 in. x 2.0 in (1.6 cm x 5.1 cm)	1000

3M™ Caution Labels

3M™ Caution Labels

Destructible, black printing on yellow background. This label shows the military force-arrows symbol and a warning message.

Product No.	Description	Labels per Roll
CLABEL2X2	Destructible Yellow w/ Black Type. Displays military force-arrows and warning. Size: 2 in. x 2 in. (5.1 cm x 5.1 cm)	500
CLABEL4X4	Destructible Yellow w/ Black Type. Displays military force-arrows and warning. Size: 4 in. x 4 in. (10.2 cm x 10.2 cm)	100

3M™ Military Label 129LABEL

3M™ Military Labels

Destructible, black printing on yellow background. Displays warning symbol and message in accordance with MIL-STD-129.

Product No.	Description	Labels per Roll
7202	Destructible Yellow w/ Black Type. MIL-STD-129 Symbol Size: 2 in. x 2 in. (5.1 cm x 5.1 cm)	500
129LABEL	Destructible Yellow w/ Black Type. MIL-STD-129 Symbol Size: 2 in. x 2 in. (5.1 cm x 5.1 cm)	500
7204	Destructible Yellow w/ Black Type. MIL-STD-129 Symbol Size: 4 in. x 4 in. (10.2 cm x 10.2 cm)	250

3M™ RoHS Label

3M™ RoHS Label

This destructible label shows Pb free and RoHS compliance. White printing on green background.

Product No.	Description	Labels per Roll
RoHSLABEL	Destructible Green/White Type. Size: 1.75 in. x 1.75 in. (4.5 cm x 4.5 cm)	500

3M™ Labels, Reusable

Labels alert personnel handling bags, boxes or other carriers that the contents are static-sensitive. 3M labels are easy to use and provide the ESD symbol and warning message needed to complete your protective package. These reusable type labels allow you to reopen the bag without tearing the label.

3M™ Attention Labels

3M™ Attention Label

Reusable, black printing on orange background. This JEDEC-14 label displays the reaching hand symbol and provides writing space.

Product No.	Description	Labels per Roll
7101	Reusable Orange w/Black Type JEDEC-14 Symbol Size: 1.875 in. x 2.5 in. (4.8 cm x 6.4 cm)	500

3M™ Attention Labels 7201, 7203

3M™ Military Labels

Reusable, black printing on yellow background. These labels display warning symbol and message in accordance with MIL-STD-129.

Product No.	Description	Labels per Roll
7201	Reusable Yellow w/Black Type MIL-STD-129 Symbol Size: 2 in. x 2 in. (5.1 cm x 5.1 cm)	500
7203	Reusable Yellow w/Black Type. MIL-STD-129 Symbol Size: 4 in. x 4 in (10.2 cm x 10.2 cm)	250

3M™ Label Dispenser

3M™ Label Dispenser

Convenient bench-top dispenser holds two 2 in. wide rolls or one 4 in. wide roll.

Product No.	Description
LABELDISPNSR	Convenient benchtop dispenser holds two 2 in. (5.1 cm) wide rolls or one 4 in. (10.2 cm) wide roll.

3M™ Heat Sealer

3M™ Heat Sealer

Securely seals plastic bags closed. 3M™ Static Shielding Bags are heat sealable. Dependable, impulse design features a time/temperature control and PTFE-covered sealing elements. Lightweight, portable table model. No warm-up needed. Hot only while sealing. 12 or 16 in. wide sealers.

Product No.	Description
500210	12 in. (30.5 cm) wide
600210	16 in. (40.6 cm) wide

Related Products

Static Shielding Bags . . . . . pg. 2
Moisture Barrier Bags Dri-Shield. . . . . pg. 13

Packaging

3M™ ZipTop Reclosable Static Shielding Bags

As an alternative to folding your bags and securing them with a warning label, try our ZipTop reclosable bags. We use quality-tested zipper material and our own custom built machines to make zipper bags that have a reputation for outstanding reliability. Bags are RoHS Compliant* and lead-free**.

3M™ ZipTop Reclosable Static Shielding Bags

Features

- Same Faraday shielding, durability, and structure as open top bags.
- ZipTop zipper is welded to the bag interior for reliability.
- Bags are printed with ESD Warning symbol and lot coded for QC traceability.
- Testable to industry standards.

Product No.	Description
SCC 1000	Metal-In Static Shielding Bag
SCC 1500	Metal-Out Static Shielding Bag
SCC 1300	Puncture Resistant Metal-In Static Shielding Bag
2110R	Puncture Resistant Metal-Out Static Shielding Bag

3M™ ZipTop Reclosable Static Shielding Bag SCC 1000

Transparent, metallized static shield bag provides a static safe environment for sensitive electronic devices. See sizes on page 4.

3M™ ZipTop Reclosable Static Shielding Bag SCC 1500

Best protection from ESD through low charge retention and rapid static decay. See sizes on page 5.

3M™ ZipTop Reclosable Static Shielding Bag SCC 1300

High puncture resistance provides a long life and reduces tears.
For tubes and heavy items.

3M™ ZipTop Reclosable Static Shielding Bag 2110R

High puncture resistance provides a long life and reduces tears. For tubes and heavy items. Best protection from ESD through low charge retention and rapid static decay.

3M™ TapeTop Adhesive Closure Bags

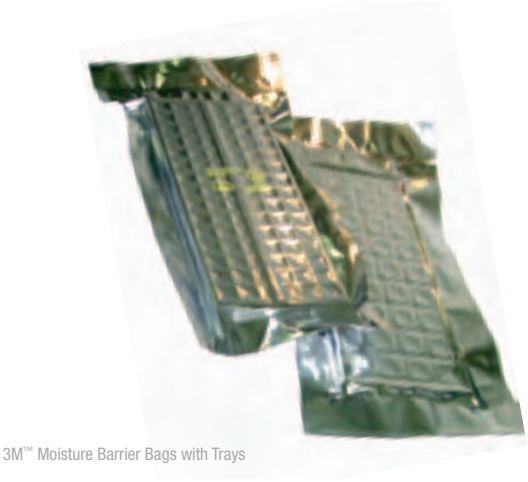
TapeTop Adhesive Closure Bags offer a self-sealing tape closure that is re-sealable for multiple uses. The bags are easy to open and do not require a heat sealer to close. To close the bag, simply peel off the cover strip and fold the flap closed. Open the bag by lifting the flap. TapeTop closure is available on all 3M Static Shielding Bags.

Peel

Stick

Closed

RoHS Compliant 2002/95/EC



3M™ Moisture Barrier Bags with Trays

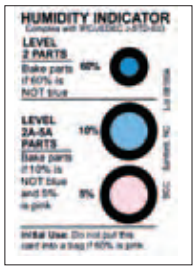
How to Dry Pack per Standard JEDEC 033

3M Dry Packaging Products

3M has developed a system of products to help companies packaging Surface Mount Devices (SMDs) meet the requirements of the Joint IPC/JEDEC Standard J-STD-033. This document creates standardized methods for packing, shipping and handling moisture sensitive SMDs. Requirements for Moisture Barrier Bags (MBB), Bag Labeling, Humidity Indicator Cards (HIC) and Desiccant loading have been established within this standard. The 3M™ Dri-Shield System meets each of these requirements.

3M™ Moisture Barrier Bags, Page 13

Choose Dri-Shield 3000, 3200 or 3400. These bags exceed 033's MVTR requirement of <0.002 grams/100in²/24hours and comply with other 033 requirements.



3M™ Humidity Indicator Cards (HICs), Page 17

HIC 51060HIC125 meets the IPC/JEDEC J-STD-033B standard.
Card size: 2 in. x 3 in. (5.1 cm x 7.6 cm)
Indicates: 5,10, 60%
Packing: 125 cards

3M™ Desiccants, Page 17

3M's desiccant complies with MIL-D-3464, TYPE II as required by 033. 3M offers eight fractional unit and whole unit sizes in Kraft and Tyvek™ pouches.

3M™ Vacuum Sealers, Page 18

Consider one of these three models to seal the bag and to reduce the bulk of entrapped air to better fit your product inside a box: Economy, Standard and Premium. These models allow you to choose the features that work best for your application.

3M™ Dry Packaging Labels, Page 18

The Moisture Sensitive Caution Label meets both J-STD-033 and JEP113 requirements. This 4 in. x 4 in. (10.2 cm x 10.2 cm) adhesive label is packaged 100 labels per roll. 3M can also pre-apply the labels to moisture barrier bags, saving time and labor costs.

Packaging

3M™ Moisture Barrier Bags

3M is one of the leading manufacturers of moisture barrier bags, offering short lead times for custom bag sizes to fit your application. Bags are marked with Moisture and ESD caution information, RoHS compliant symbols, and are lot coded for traceability. Custom printing is available. Moisture barrier bags are designed to protect electronic items from moisture, electrostatic, physical and environmental damage during manufacture, transportation, and storage. As required in ANSI/ESD S541, and as part of the ANSI/ESD S20.20 ESD control program, barrier bags provide protection from static discharge and are low charging. Get all the items to meet IPC/JEDEC J-STD-033: See page 13 for bags, page 17 for HICs and desiccants, and page 18 for labels and sealers.

IPC/JEDEC J-STD-033 for Devices

Surface mount devices (SMD) are attached to circuit boards by reheating solder on the pads. This technique, called reflow soldering, heats the circuit board, device leads and the device case. Moisture trapped inside the device case can expand at a rate faster than the case, causing the case to rupture. To prevent this damage, the IPC/JEDEC J-STD-033 standard sets requirements for foil barrier bags, desiccant, humidity indicator cards, labeling and bag sealing. 3M supplies all of the items needed for compliance.

3M™ Moisture Barrier Bags Product Selection Guide

Product	Technology	Benefit	Application	Page
Bags for IPC/JEDEC J STD-033 MVTR				
Dri-Shield 3000	Moisture Barrier Bag, Foil, 6 mil	Designed to meet the requirements of IPC/JEDEC J-STD-033 for the dry packaging of electronic devices. Dri-Shield 3000 bags are made from dissipative nylon, foil, and dissipative polyethylene. These bags protect SMDs from moisture and static damage. Flexible structure is easy to vacuum seal. Lot coded for QC traceability.	Dry packaging of devices in compliance with IPC/JEDEC J-STD-033.	pg. 13
Dri-Shield 3400	Moisture Barrier Bag, Foil, 4 mil	For dry packaging of electronic devices. Dri-Shield 3400 bags are made from a high barrier foil structure. Bags protect SMDs from moisture and static damage. Flexible structure is easy to vacuum seal. Lot coded for QC traceability.	Value packaging: higher puncture resistance with less thickness. Dry packaging of devices in compliance with IPC/JEDEC J-STD-033.	pg. 13
Puncture Resistant				
Dri-Shield 3700	Puncture Resistant Moisture Barrier Bag, Foil, 4 mil	Bags provide superior puncture resistance and drop test performance. This reduces vacuum loss due to punctures from sharp trays and rough handling. Also meets the requirements of IPC/JEDEC J-STD-033 easy to vacuum seal. Lot coded for QC traceability.	Highest puncture resistance to reduce vacuum loss. Dry packaging of devices in compliance with IPC/JEDEC J-STD-033.	pg. 14
Low Voltage Retention (Metal-Out)				
Dri-Shield 3200	Metal-out Moisture Barrier Bag, Foil, 3.6 mil	Metal-out structure meets the dry packaging requirements of IPC/JEDEC J-STD-033, and provides charge retention of less than 50 volts. This combination of technology helps prevent static damage to transient-sensitive devices.	Low voltage retention for sensitive devices. Dry packaging of devices in compliance with IPC/JEDEC J-STD-033.	pg. 14

Related Products

Humidity Indicator Cards. . . . . pg. 17
Desiccants . . . . . pg. 17
Labels. . . . . pg. 18
Vacuum Sealers . . . . . pg. 18

3M™ Moisture Barrier Bag with 3M™ Humidity Indicator Card and 3M™ Desiccant

MIL-PRF-81705 for Assemblies

Disk drives, bare cards, and other components are subject to corrosion during storage and shipment. Metallized moisture barrier bags that meet the barrier limit established in MIL-PRF-81075 can help to prevent this damage.

See “How to Dry Pack”, page 10.

3M™ Moisture Barrier Bags Product Selection Guide

Product	Technology	Benefit	Application	Page
Bags for MIL-PRF-81705 MVTR				
Dri-Shield 2000	Moisture Barrier Bag, Aluminized, 3.6 mil	Bags are made from multiple layers of metallized polyester and dissipative polyethylene. Bags protect SMDs from moisture and static damage. Flexible structure is easy to vacuum seal. Lot coded for QC traceability.	Dry packaging of devices in compliance with MIL-PRF-81705 MVTR.	pg. 15
3370	Moisture Barrier Bag, Aluminized, 3.6 mil	Bags are made from multiple layers of metallized polyester and dissipative polyethylene. Bags protect SMDs from moisture and static damage. Contains no amines, amides or N-Octanoic Acid. Outgassing levels are extremely low.	Outgassing levels are extremely low. Dry packaging of devices in compliance with MIL-PRF-81705 MVTR.	pg. 15
Puncture Resistant				
Dri-Shield 2700	Puncture Resistant Moisture Barrier Bag, Aluminized, 7 mil	Dri-Shield 2700 bags provide superior puncture resistance and drop test performance. This reduces vacuum loss due to punctures from sharp trays and rough handling. Bags protect from moisture and static damage. Lot coded for QC traceability.	Highest puncture resistance to reduce vacuum loss. Dry packaging of devices in compliance with MIL-PRF-81705 MVTR.	pg. 16
Low Voltage Retention (Metal-Out)				
Dri-Shield 2500	Metal-Out Moisture Barrier Bag, Aluminized, 3.6 mil	Combines the moisture barrier technology and low charge retention for charge retention of less than 50 volts and shielding as low as 1 nJ. Stops static damage to transient-sensitive GMR devices.	Dry packaging of devices in compliance with MIL-PRF-81705 MVTR.	pg. 16
ZipTop Reclosable Barrier Bags				
Dri-Shield 3400 ZipTop	Reclosable ZipTop Moisture Barrier Bag, Foil, 4 mil	ZipTop feature makes the bag easy to open and close. Dri-Shield 3400 bags are made from a high barrier foil structure. Bags should be heat sealed to fully protect SMDs from moisture.	Reclosable to allow for access to parts. Dry packaging of devices in compliance with IPC/JEDEC J-STD-033.	pg. 13
Dri-Shield 2000 ZipTop	Reclosable ZipTop Moisture Barrier Bag, Aluminized, 3.6 mil	ZipTop feature makes the bag easy to open and close. Bags should be heat sealed to fully protect from moisture.	Reclosable to allow for access to parts. Dry packaging in compliance with MIL-PRF-81705.	pg. 15

Packaging

3M™ Moisture Barrier Bag Dri-Shield 3000

3M™ Moisture Barrier Bag Dri-Shield 3000

Made from static dissipative nylon, aluminum foil, and static dissipative polyethylene, the bag offers extremely low MVTR and is designed to provide maximum moisture protection for surface mount devices (SMD). Please inquire for sizes. Bags are RoHS Compliant* and lead-free**.

Features

- Meets the requirements of IPC/JEDEC J-STD-033.
- Strong, heat sealable, suitable for vacuum packaging.
- Meets electrical and physical requirements of EIA 583, ANSI/ESD S541, EIA625, and MIL-PRF-81705, and ANSI/ESD S20.20.
- Static safe: dissipative inner and outer surfaces.
- Amine free, passes outgassing and corrosion tests.
- Used for packaging SMDs in trays, shipping tubes, and tape and reel.
- Printed with ESD and moisture symbols; lot coded for traceability.
- Testable to industry standards.

Dri-Shield 3000 Bag Properties

Physical Properties		
MVTR	<0.0003 g/100 sq.in./24 hrs	ASTM F 1249
Puncture Resistance	17 lbs	MIL-STD-3010
Tear Strength (Elmendorf)	980 grams	ASTM D1922
Thickness	6.0 mils	
Tensile Strength	5400 PSI, 380kg/cm^2	ASTM D882
Seal Strength	>15 lbs	ASTM D882
Electrical Properties		
Surface Resistivity/Resistance		
	ASTM D257	**ANSI/ESD STM11.11**
Interior	<10^{12} ohm/square	or <10^{11} ohm
Exterior	<10^{12} ohm/square	or <10^{11} ohm
Metal	<100 ohm	
Static Shielding	<15 volts	MIL-PRF-81705, EIA 541
Static Shielding	<10 nJ	ANSI/ESD S11.31
EMI Attenuation	45 dB	MIL-PRF-81705
Static Decay	<0.03 seconds	MIL-STD-3010
Silicon or Amine Content	Not detected	FTIR

3M™ Moisture Barrier Bag Dri-Shield 3400

3M™ Moisture Barrier Bag Dri-Shield 3400

Specially designed for high volume applications, this bag offers the barrier properties required by JEDEC specs at a lower cost. Please inquire for sizes. Bags are RoHS Compliant* and lead-free**.

Features

- Meets the requirements of IPC/JEDEC J-STD-033.
- Strong, lightweight, heat sealable, suitable for vacuum packaging.
- Meets electrical and physical requirements of EIA 583, ANSI/ESD S541, EIA625, and MIL-PRF-81705, and ANSI/ESD S20.20.
- Static safe: dissipative inner and outer surfaces.
- Amine free, passes outgassing and corrosion tests.
- Used for packaging SMDs in trays, shipping tubes, and tape and reel.
- Printed with ESD and moisture symbols; lot coded for traceability.
- Testable to industry standards.

Dri-Shield 3400 Bag Properties

Physical Properties		
MVTR	<0.0003 g/100 sq.in./24 hrs	ASTM F 1249
Puncture Resistance	20 lbs	MIL-STD-3010
Tear Strength (Elmendorf)	110 grams	ASTM D1922
Thickness	4.0 mils	
Tensile Strength	8500 PSI, 598kg/cm^2	ASTM D882
Seal Strength	>15 lbs	ASTM D882
Electrical Properties		
Surface Resistivity/Resistance		
	ASTM D257	**ANSI/ESD STM11.11**
Interior	<10^{12} ohm/square	or <10^{11} ohm
Exterior	<10^{12} ohm/square	or <10^{11} ohm
Metal	<100 ohm	
Static Shielding	<20 volts	MIL-PRF-81705, EIA 541
Static Shielding	<10 nJ	ANSI/ESD S11.31
EMI Attenuation	45 dB	MIL-PRF-81705
Static Decay	<0.01 seconds	MIL-STD-3010
Silicon or Amine Content	Not detected	FTIR

033 Compliant Product
RoHS Compliant 2002/95/EC
3M Products are ESD 20.20 Program Compliant

3M™ Metal-Out Moisture Barrier Bag Dri-Shield 3200

3M™ Metal-Out Moisture Barrier Bag
Dri-Shield 3200

This bag is engineered to provide low charge retention and rapid static decay. Low MVTR provides maximum moisture protection for surface mount devices. Please inquire for sizes. Bags are RoHS Compliant* and lead-free**.

Features

- Metal layer is positioned near the outer surface for fast charge decay and low charge retention.
- Meets the requirements of IPC/JEDEC J-STD-033.
- Strong, lightweight, heat sealable, suitable for vacuum packaging.
- Meets electrical and physical requirements of EIA 583, ANSI/ESD S541, EIA625, and MIL-PRF-81705, and ANSI/ESD S20.20.
- Static safe: dissipative inner and outer surfaces.
- Amine free, passes outgassing and corrosion tests.
- Used for packaging SMDs in trays, shipping tubes, and tape and reel.
- Printed with ESD and moisture symbols; lot coded for traceability.
- Testable to industry standards.

Dri-Shield 3200 Bag Properties

Physical Properties		
MVTR	<0.0003 g/100 sq.in./24 hrs	ASTM F1249
Puncture Resistance	>20 lbs	MIL-STD-3010
Tear Strength (Elmendorf)	110 grams	ASTM D1922
Thickness	4.0 mils	
Tensile Strength	8500 PSI, 598kg/cm^2	ASTM D882
Seal Strength	>15 lbs	ASTM D882
Electrical Properties		
Surface Resistivity/Resistance		
	ASTM D257	**ANSI/ESD STM11.11**
Interior	<10^{12} ohm/square	or <10^{11} ohm
Exterior	<10^{5} ohm/square	or <10^{8} ohm
Metal	<100 ohm	
Static Shielding	<20 volts	MIL-PRF-81705, EIA 541
Static Shielding	<10 nJ	ANSI/ESD S11.31
EMI Attenuation	45 dB	MIL-PRF-81705
Static Decay	<0.01 seconds	MIL-STD-3010
Charge Retention	<100 volts	CPM
Silicon or Amine Content	Not detected	FTIR

3M™ Moisture Barrier Bag Dri-Shield 3700

3M™ Moisture Barrier Bag
Dri-Shield 3700 (label optional)

This puncture resistant bag offers more strength for packaging items with sharp edges. Low MVTR provides maximum moisture protection for surface mount devices. Please inquire for sizes. Bags are RoHS Compliant* and lead-free**.

Features

- Meets the requirements of IPC/JEDEC J-STD-033.
- Puncture resistant.
- Strong, lightweight, heat sealable, suitable for vacuum packaging.
- Meets electrical and physical requirements of EIA 583, ANSI/ESD S541, EIA625, and MIL-PRF-81705, and ANSI/ESD S20.20.
- Static safe: dissipative inner and outer surfaces.
- Amine free, passes outgassing and corrosion tests.
- Used for packaging SMDs in trays, shipping tubes, and tape and reel.
- Printed with ESD and moisture symbols; lot coded for traceability.
- Testable to industry standards.

Dri-Shield 3700 Bag Properties

Physical Properties		
MVTR	<0.0003 g/100 sq.in./24 hrs	ASTM F1249
Puncture Resistance	>25 lbs	MIL-STD-3010
Tear Strength (Elmendorf)	185 grams	ASTM D1922
Thickness	4.0 mils	
Tensile Strength	13000 PSI, 914kg/cm^2	ASTM D882
Seal Strength	>15 lbs	ASTM D882
Electrical Properties		
Surface Resistivity/Resistance		
	ASTM D257	**ANSI/ESD STM11.11**
Interior	<10^{12} ohm/square	or <10^{11} ohm
Exterior	<10^{12} ohm/square	or <10^{11} ohm
Metal	<100 ohm	
Static Shielding	<20 volts	MIL-PRF-81705, EIA 541
Static Shielding	<10 nJ	ANSI/ESD S11.31
EMI Attenuation	45 dB	MIL-PRF-81705
Static Decay	<0.01 seconds	MIL-STD-3010
Silicon or Amine Content	Not detected	FTIR

3M Products are ESD 20.20 Program Compliant

RoHS Compliant 2002/95/EC

033

Packaging

3M™ Moisture Barrier Bag Dri-Shield 2000

3M™ Moisture Barrier Bag Dri-Shield 2000

Multiple layers of metallized polyester provide puncture resistance and moisture barrier for this economical dry bag. Please inquire for sizes. Bags are RoHS Compliant* and lead-free**.

Features

- Strong, lightweight, heat sealable, suitable for vacuum packaging.
- Meets electrical and physical requirements of EIA 583, ANSI/ESD S541, EIA625, MIL-PRF-81705, and ANSI/ESD S20.20.
- Static safe: dissipative inner and outer surfaces.
- Amine free, passes outgassing and corrosion tests.
- Used for packaging SMDs in trays, shipping tubes, and tape and reel.
- Printed with ESD and moisture symbols; lot coded for traceability.
- Testable to industry standards.

Dri-Shield 2000 Bag Properties

Physical Properties		
MVTR	<0.02 g/100 sq.in./24 hrs	ASTM F1249
Puncture Resistance	>20 lbs	MIL-STD-3010
Tear Strength (Elmendorf)	48 grams	ASTM D1922
Thickness	3.6 mils	
Tensile Strength	8700 PSI, 612kg/cm^2	ASTM D882
Seal Strength	>12 lbs	ASTM D882
Electrical Properties		
Surface Resistivity/Resistance		
	ASTM D257	**ANSI/ESD STM11.11**
Interior	<10^{12} ohm/square	or <10^{11} ohm
Exterior	<10^{12} ohm/square	or <10^{11} ohm
Metal	<100 ohm	
Static Shielding	<20 volts	MIL-PRF-81705, EIA 541
Static Shielding	<10 nJ	ANSI/ESD S11.31
EMI Attenuation	45 dB	MIL-PRF-81705
Static Decay	<0.03 seconds	MIL-STD-3010
Silicon or Amine Content	Not detected	FTIR

3M™ Moisture Barrier Bag 3370

3M™ Moisture Barrier Bag 3370

The Moisture Barrier Bag 3370 has been designed to meet the demanding moisture protection needs of the electronics market. Please inquire for sizes. Bags are RoHS Compliant* and lead-free**.

Features

- Clean barrier film contains no amines, N-Octanoic Acid.
- Outgassing levels are extremely low.
- Strong, lightweight, heat sealable, suitable for vacuum packaging.
- Meets electrical and physical requirements of EIA 583, ANSI/ESD S541, EIA625, MIL-PRF-81705, and ANSI/ESD S20.20.
- Static safe: dissipative inner and outer surfaces.
- Used for packaging SMDs in trays, shipping tubes, and tape and reel.
- Printed with ESD and moisture symbols; lot coded for traceability.
- Testable to industry standards.

Moisture Barrier 3370 Bag Properties

Property	Typical Value	Test Method
Thickness	3.6 mil. (92 microns)	Measure
Moisture Vapor Transmission Rate	< 0.015 grams/100 inches^2 /24 hours (645.2 cm^2) (film and seams)	ASTM F 1249
Tensile Strength	> 8200 PSI (5.7 x 107 N/m^2)	ASTM D 882
Puncture Resistance	> 20 lbs. (9.07 kg)	FTMS 101C Method 2065
Seam Strength	Pass (3.5 lb./1.6 kg hanging weight)	Mil PRF 81705(D)
Surface Resistance (Interior and Exterior)	<1 x 10^{11} ohm @12% R.H.	ANSI/ESD S11.11
Metal Layer	< 100 ohm	Monroe 267 Buried Layer
Static Discharge Shielding	< 7 nJ	ANSI/ESD S11.31
Outgassing	<10µg/g Total outgassing, < 1µg/g Hydrocarbons	Static Headspace
Ionic Contamination	<20 ng/cm^2: Na, F, PO_4, SO_4, Cl, NH_4 <100 ng/cm^2: NO_3	Extraction/IC
Non Volatile Residue	<1 µg/cm^2	ASTM E1235 (reference)
Polycarbonate Compatibility	Pass - 185°F (85°C), 3400 PSI	EIA 564
Amines, Amides, Silicon	None Added	FTIR/NMR

RoHS Compliant 2002/95/EC

3M Products are ESD 20.20 Program Compliant

3M™ Metal-Out Moisture Barrier Bag Dri-Shield 2500

3M™ Metal-Out Moisture Barrier Bag Dri-Shield 2500

This bag is engineered to provide low charge retention and rapid static decay. Provides moisture protection for sensitive assemblies. Please inquire for sizes. Bags are RoHS Compliant* and lead-free**.

Features

- Metal layer is positioned near the outer surface for fast charge decay and low charge retention.
- Strong, lightweight, heat sealable, suitable for vacuum packaging.
- Meets electrical and physical requirements of EIA 583, ANSI/ESD S541, EIA625, MIL-PRF-81705, and ANSI/ESD S20.20.
- Static safe: dissipative inner and outer surfaces.
- Used for packaging SMDs in trays, shipping tubes, and tape and reel.
- Printed with ESD and moisture symbols; lot coded for traceability.
- Testable to industry standards.

Dri-Shield 2500 Bag Properties

Physical Properties		
MVTR	<0.02 g/100 sq.in./24 hrs	ASTM F 1249
Puncture Resistance	>20 lbs	MIL-STD-3010
Tear Strength (Elmendorf)	48 grams	ASTM D 1922
Thickness	3.6 mils	
Tensile Strength	8700 PSI, 612kg/cm^2	ASTM D882
Seal Strength	>12 lbs	ASTM D882
Electrical Properties		
Surface Resistivity/Resistance		
	ASTM D257	**ANSI/ESD STM11.11**
Interior	<10^{12} ohm/square	or <10^{11} ohm
Exterior	<10^{5} ohm/square	or <10^{8} ohm
Metal	<100 ohm	
Static Shielding	<20 volts	MIL-PRF-81705, EIA 541
Static Shielding	<5 nJ	ANIS/ESD S11.31
EMI Attenuation	45 dB	MIL-PRF-81705
Static Decay	<0.03 seconds	MIL-STD-3010
Charge Retention	<100 volts	CPM
Silicon or Amine Content	Not detected	FTIR

3M™ Moisture Barrier Bag Dri-Shield 2700

3M™ Moisture Barrier Bag Dri-Shield 2700

This puncture resistant bag offers more strength for packaging items with sharp edges. Provides moisture protection for sensitive assemblies. Please inquire for sizes. Bags are RoHS Compliant* and lead-free**.

Features

- Puncture resistant.
- Strong, lightweight, heat sealable, suitable for vacuum packaging.
- Meets electrical and physical requirements of EIA 583, ANSI/ESD S541, EIA625, MIL-PRF-81705, and ANSI/ESD S20.20.
- Static safe: dissipative inner and outer surfaces.
- Amine free, passes outgassing and corrosion tests.
- Used for packaging SMDs in trays, shipping tubes, and tape and reel.
- Printed with ESD and moisture symbols; lot coded for traceability.
- Testable to industry standards.

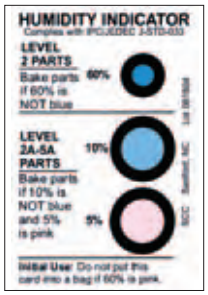
Dri-Shield 2700 Bag Properties

Physical Properties		
MVTR	<0.005 g/100 sq.in./24 hrs	ASTM F 1249
Puncture Resistance	30 lbs	MIL-STD-3010
Tear Strength (Elmendorf)	215 grams	ASTM D 1922
Thickness	7.0 mils	
Tensile Strength	6800 PSI, 478kg/cm^2	ASTM D882
Seal Strength	>15 lbs	ASTM D882
Electrical Properties		
Surface Resistivity/Resistance		
	ASTM D257	**ANSI/ESD STM11.11**
Interior	<10^{12} ohm/square	or <10^{11} ohm
Exterior	<10^{12} ohm/square	or <10^{11} ohm
Metal	<100 ohm	
Static Shielding	<20 volts	MIL-PRF-81705, EIA 541
Static Shielding	<10 nJ	ANIS/ESD S11.31
EMI Attenuation	45 dB	MIL-PRF-81705
Static Decay	<0.01 seconds	MIL-STD-3010
Silicon or Amine Content	Not detected	FTIR

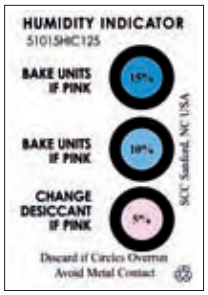
3M Products are ESD 20.20 Program Compliant

RoHS Compliant 2002/95/EC

Packaging

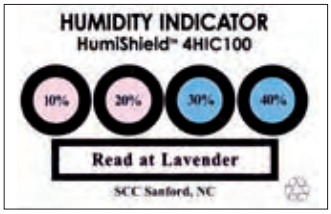


3M™ Humidity Indicator Card 5, 10, 60% RH

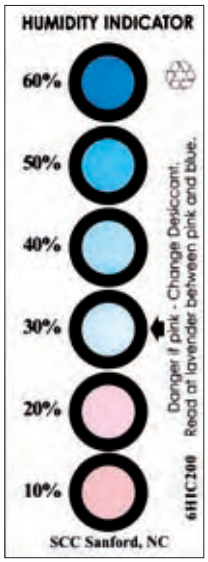


3M™ Humidity Indicator Card 5, 10, 15% RH

3M™ Humidity Indicator Card MS 20003-2 Compliant



3M™ Humidity Indicator Card 10, 20, 30, 40% RH



3M™ Humidity Indicator Card MIL-I-8835 Compliant

3M™ Humidity Indicator Card (HIC)

HICs are printed with moisture sensitive spots which respond to various levels of humidity with a visible color change from blue to pink. HICs are used inside vacuum sealed (dry packed) moisture barrier bags to monitor the interior humidity conditions of the package. When the bag is opened, the card can be examined to verify proper dryness inside the bag. This indicates that the moisture barrier bag and desiccant functioned correctly. Performance tested. Lot traceable. RoHS Compliant* and lead-free**.

Product No.	Description	Cards Per Can
51060HIC125	JEDEC compliant Meets IPC/JEDEC J-STD-033 revision B. Indicates 5, 10, 60% RH. Size: 2 in. x 3 in. (5.1 cm x 7.6 cm)	125
51015HIC125	JEDEC compliant Meets IPC/JEDEC J-STD-033 revision A. Indicates 5, 10, 15% RH. Size: 2 in. x 3 in. (5.1 cm x 7.6 cm)	125
4HIC100	EIA583 compliant Indicates 10, 20, 30, 40% RH. Size: 2 in. x 3 in. (5.1 cm x 7.6 cm)	100
6HIC200	MIL-I-8835 compliant Indicates 10, 20, 30, 40, 50, 60% RH. Size: 1.56 in. x 4.75 in. (4.0 cm x 12.1 cm)	200
3HIC125	MS20003-2 compliant Indicates, 30, 40, 50% RH. Size: 2 in. x 3 in. (5.1 cm x 7.6 cm)	125

RoHS Compliant 2002/95/EC

3M™ Desiccant, Tyvek™ Pouch

3M™ Desiccant, Kraft Pouch

3M™ Desiccant

Desiccant works by efficiently absorbing airborne moisture left inside the bag after vacuum sealing, and captures moisture that manages to pass through the bag material. Secure in a strong envelope of either cleanroom compatible, sulphur-free Tyvek™ or economical Kraft paper, these desiccants are designed to keep your devices dry. Meets the requirements of IPC/JEDEC J-STD-033 and MIL-D-3464, Types I & II.

Pouch Size	Part Number Tyvek	Part Number Kraft	Pouches per Container
1/6 Unit	1/6TYDES1200	1/6KDES1200	1200
1/3 Unit	1/3TYDES700	1/3KDES700	700
1/2 Unit	1/2TYDES550	1/2KDES550	550
1 Unit	1TYDES300	1KDES300	300
1 Unit	1TYDES1300	1KDES1300	1300
2 Unit	2TYDES150	2KDES150	150
2 Unit	2TYDES800	2KDES800	800
4 Unit	4TYDES500	4KDES500	500
8 Unit	8TYDES300	8KDES300	300
16 Unit	16TYDES150	16KDES150	150

3M™ Label 113

3M™ Dri-Label

3M™ Dry Packaging Label

Product No.	Description	Labels per Roll
113LABEL 4 in. x 4 in. (10.2 cm x 10.2 cm)	For use with dry packaging applications. Displays the warning symbol and message in accordance with IPC/JEDEC J-STD-033 and JEDEC113. 3M can pre-apply this label to bags.	100
DRILABEL 4 in. x 5 in. (10.2 cm x 12.7 cm)	For use with dry packaging applications. Displays static awareness symbol and EIA 583 moisture symbol. Provides writing space.	100

3M™ Vacuum Sealer 635 *Premium Performance*

3M™ Vacuum Sealer 635

- Electronic control center
- Retracting vacuum nozzle
- Automatic operation

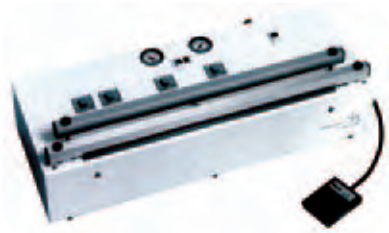
Part No. 635VACUSEAL

3M™ Vacuum Sealer

A vacuum sealer evacuates moisture laden air from moisture barrier bags, and then heat seals the bags closed. This is part of the dry packaging process that protects surface mount devices from moisture. A vacuum sealer, a moisture barrier bag, desiccant, and humidity indicator card (HIC) make up the complete system for dry packaging. Check for availability in your country.

Product No.	Description
635VACUSEAL	Premium Vacuum Sealer
35VACUSEAL	Standard Vacuum Sealer
235VACUSEAL	Economy Vacuum Sealer

3M™ Vacuum Sealer 35 *Standard Performance*

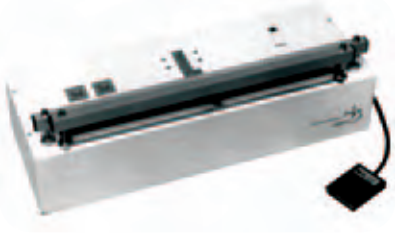


3M™ Vacuum Sealer 35

- Vacuum, heat, cool timers
- Fixed vacuum nozzle
- Semi-automatic operation

Part No. 35VACUSEAL

3M™ Vacuum Sealer 235 *Economy Performance*



3M™ Vacuum Sealer 235

- Heat and cool timers
- Retracting vacuum nozzle
- Manual operation

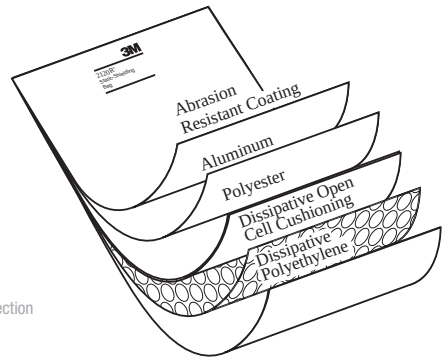
Part No. 235VACUSEAL

Packaging

3M™ Metal-Out Cushioned Static Shielding Bags

Metal-Out Cushioned Static Shielding Bags 2120R protect devices from physical damage as well as provide proper static shielding.

3M™ Metal-Out Cushioned Static Shielding Bag 2120R



Cross Section

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	(30.5 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 Sizes Limits, in.	(cm)
	5 x 5 to 24 x 23	(12.7 x 12.7 to 61 x 58.4)

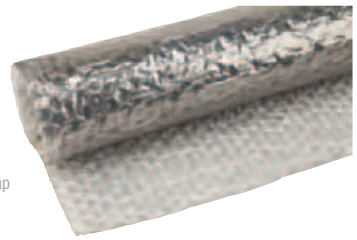
Dimensions are inside measurements (W x L). Custom printing on bags available by special order. (Please contact 3M Customer Service for quotations.)

Cushioned Static Shielding Bag 2120R Properties

Property	Test Method	Typical Value
Thickness	PPP-C-1842	125 mil (3.2 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	$<10^{11}$ ohm
Metallized Layer	Monroe #267	$<10^{2}$ ohm/sq.
Shielding	EIA-541	<30V
Electrostatic Decay		
Interior	EIA-541	<2 sec.
Contact Corrosivity	FTMS 101C, Method 3005	Pass
Shelf Life		1 Year

3M™ Cushioned Shielding Wrap

Cushioned Shielding Wrap 2126R provides static shielding and physical protection for large or irregularly shaped circuit boards. Heat sealable inner surface.



3M™ Cushioned Sealing Wrap

Product No.	Description	
2126R	Cushioned Shielding Wrap. Supplied in rolls.	
	Standard Sizes	(cm)
	24 in. x 125 ft.	(61.0 x 3180.0)
	48 in. x 125 ft.	(122.0 x 3180.0)

Cushioned Shielding Wrap 2126R Properties

Property	Test Method	Typical Value
Thickness	PPP-C-1842	125 mil (3.2 mm)
Strength		
Tensile	ASTM D882	34 lbs./in.
Puncture	FTMS 101	22 lbs. (10 kg)
Surface Resistance/ Resistivity		
Interior	EIA-541, ASTM D257	$<10^{12}$ ohm/sq.
Exterior	ANSI/ESD S11.11	$<10^{11}$ ohm
Metallized Layer	Monroe #267	$<10^{2}$ ohm/sq.
Shielding	EIA-541	<30 V
Electrostatic Decay		
Interior	ANSI/ESD S11.11	<2 sec.
Contact Corrosivity	FTMS 101C, Method 3005	Pass
Shelf Life		1 Year

RoHS Compliant 2002/95/EC

3M™ MIL Spec Bag

3M™ Moisture Barrier Bag SCC 2000MQPL/Military

3M™ Moisture Barrier Bag SCC 2000MQPL/Military

Moisture Barrier Bags are made from MIL-PRF-81705 Type I material that appears on the Navy Qualified Products List (QPL) and are converted per MIL-DTL-117.

Product No.	Description
2000MQPL	Military Moisture Barrier Bag

3M™ Barrier Bag MILpac 131

3M™ Barrier Bag MILpac 131

Barrier Bag MIL-PRF-131 provides protection for critical items susceptible to damage by moisture or corrosion. This material appears on the Qualified Products List (QPL). Bag converted per MIL-DTL-117.

Product No.	Description
MILpac 131	Barrier Bag MIL-PRF-131

Packaging

3M™ Conductive Bag

3M™ Conductive Bags 2004

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 mils thick. 100 bags per pack.

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) 6 x 10 (15.2 x 25.4) 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, in. (cm) 4 x 4 to 42 x 72 (10.2 x 10.2 to 106.7 x 182.9)

3M™ Conductive Drum Liners

3M™ Conductive Drum Liner 2014

Conductive Drum Liners 2014 do not hold static charge when grounded. Commonly used as waste container liners, for holding chemicals that could be ignited by a static caused spark, or dry chemicals that tend to cling to ordinary nonconductive static-laden plastics. 100 bags per box.

Product No.	Description
2014	Drum Liners. Wall thickness: 4.0 mil (102 microns) 100 per box Standard Sizes, in. (cm) 5 gallon: 18 x 24 (45.7 x 61.0) 20 gallon: 24 x 36 (61.0 x 91.4) 30 gallon: 30 x 36 (76.2 x 91.4) *55 gallon: 38 x 58 (96.5 x 147.3) * Available 50 per box

Conductive Packaging 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 x 105 – 4.1 x 105 N/m2)
Vicat Softening Temperature		-50°F – 150°F (-46°C – 66°C)
Vicat Softening Temperature	ASTM D1525	83°C

Property	Test Method	Typical Value
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.

RoHS Compliant 2002/95/EC

3M™ Conductive Film

3M™ Conductive Film 1700, 1760 Series

Conductive Film 1700 is opaque, volume-conductive, carbon-impregnated polyolefin, and is commonly used for material handling, shipping and storage in the electronic or chemical industries.

Product No.	Description
Short Rolls	
1704	Film. Thickness: 4.0 mil (102 microns) Widths, in. (cm) Approx. Length/Roll, ft. (m) 36 (91.4) 150 (45.7) 54 (137.2) 150 (45.7) 72 (182.9) 150 (45.7)
1706	Film. Thickness: 6.0 mil (152.4 microns) Widths, in. (cm) Approx. Length/Roll, ft. (m) 36 (91.4) 150 (45.7) 54 (137.2) 150 (45.7) 72 (182.9) 150 (45.7)
1708	Film. Thickness: 8.0 mil (203.2 microns) Widths, in. (cm) Approx. Length/Roll, ft. (m) 36 (91.4) 150 (45.7) 54 (137.2) 150 (45.7) 72 (182.9) 150 (45.7)
Long Rolls	
1764	Film. Thickness: 4.0 mil (102 microns) Widths, in. (cm) Approx. Length/Roll, ft. (m) 36 (91.4) 1,500 (457.2)

3M™ Conductive Tubing

3M™ Conductive Tubing 1724

Conductive Tubing 1724 is made of opaque, volume conductive carbon-impregnated polyolefin, and is used to make bags and sleeves for specialized packaging or storage requirements. The tubing is heat-sealable and can be used on automated packaging lines.

Product No.	Description
1724	Lay Flat Conductive Tubing. Thickness: 4.0 mil (102 microns) Widths, in. (cm) Approx. Length/Roll, ft. (m) 5 (12.7) 500 (152.4) 12 (30.5) 500 (152.4)

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.

Conductive Packaging 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 x 105 – 4.1 x 105 N/m2)
Vicat Softening Temperature		-50°F – 150°F (-46°C – 66°C)
Vicat Softening Temperature	ASTM D1525	83°C

Property	Test Method	Typical Value
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.

RoHS Compliant 2002/95/EC

Packaging

3M™ Conductive Container

Conductive Containers are ideal for static-safe storage, kitting, and in-process handling and transporting of static-sensitive assemblies and devices. Made from injection-molded plastic, these containers are noncorrosive and lightweight. Static-sensitive devices can be transported in these containers which provide protection from static discharge and from static fields.

3M™ Single Card Carrier

3M™ Single Card Carrier

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.

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.

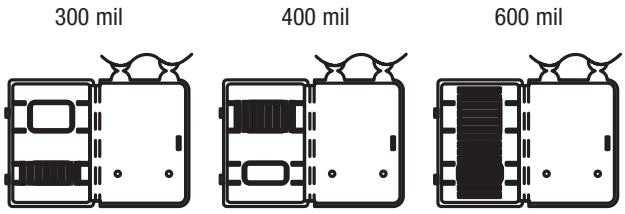
3M™ Single Device Carrier 5701

3M™ Single Device Carrier

The rugged injection-molded Single Device Carrier 5701 is designed to provide 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.



3M™ Hinged Container

3M™ Hinged Container

Hinged Containers are made from injection-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.

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.

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 (9.9)	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 (12.7)	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.

3M™ Round Container

Round Containers feature separate containers and lids.

3M™ Round Containers

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 (5.9)
4015	3.81 (9.7)	4.69 (11.9)

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

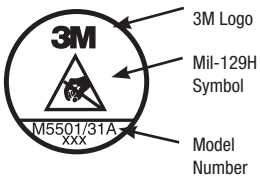
Container Properties

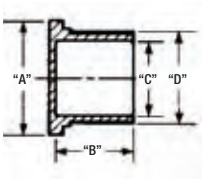
Typical Property	Test Method	4540 EVA Copolymer Compound / 1801 Sheet Stock Typical Value*	4520 Polypropylene Compound / 1840 Sheet Stock Typical Value**
Hardness	ASTM D2240	58 - 62 Shore D	67 - 71 Shore D
Heat Deflection Temp.	ASTM D648	38° - 43°C @ 264 PSI	100°C @ 66 PSI; 50°C @ 264 PSI
Water Absorption	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.

Packaging

3M™ Circular Connector Cover 4270 Series





3M™ Connector Cover

3M Connector Covers are made of an intrinsically conductive composite material with uniformly distributed fibers. This makes the covers free of carbon black particulate and better suited to clean situations. The covers do not leave black marks and are permanently conductive. For sizes, see the product data sheet at www.3MStatic.com

3M™ Circular Connector Cover 4270 Series

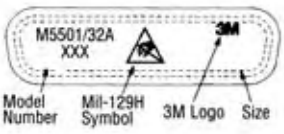
Circular Connector Cover 4270 Series were designed to meet the requirements and intentions of MS90376,and MIL PRF 5501/31A or 32A. Military contractors have qualified these materials to their own specifications and are encouraging their use.

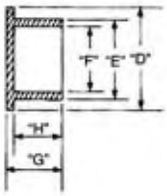
Product No.	Description
4270	Feature a unique conductive composite material. Noncorrosive and produce no visible corrosion. Connector Covers 4270 Series were designed to meet the requirements and intentions of MS90376 and MIL PRF 5501/31A or 32A.

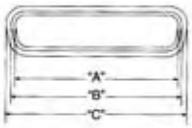
3M™ "D" Type Connector Cover 4272 Series

3M "D" Type Connector Cover 4272 Series

"D" Type Connector Covers were designed to meet the requirements and intentions of MIL-PRF-5501. 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 (1.0×10^7 N/m^2)
Vicat Softening	ASTM MD 1525	205°F (96°C)
Outgassing	ASTM E595	Pass
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™ Wrist Strap Product Selection Guide

Wrist Strap Type	Features	Model Number	Page #
Premium			
Fabric	Adjustable knitted burgundy band, available with 5 ft. (1.5 m) and 10 ft. (3.0 m) cords, 1,000,000+ flexes	2204 and 2210 or 2220	pg. 27
	Adjustable fabric blue band with machined stud, available with 6 ft. (1.8 m) and 12 ft. (3.6 m) cord, 1,000,000+ flexes	WBB-AFWS61M and WBB-AFWS121M	pg. 27
	Dual conductor adjustable turquoise fabric band, available with 5 ft. (1.5 m), 10 ft. (3.0 m), and 20 ft. (6.0 m) dual conductor cord, use with dual conductor monitors	2368 with 2360, 2370 or 2371	pg. 31
Metal	Fixed size metal band, S,M,L	2205, 2206, 2207	pg. 29
	Adjustable metal band available with 6 ft. (1.8 m) and 12 ft. (3.6 m) cord	AMWS61M and AMWS121M	pg. 30
	Dual conductor fixed size metal bands (S, M, L) with 5 ft. (1.5 m), 10 ft. (3.0 m), 20 ft. (6.0 m) dual conductor cord	2380 Series Metal Bands	pg. 31
Standard			
Fabric	Lay-in stretch blue or maroon band available with 6 ft. (1.8 m) and 12 ft. (3.6 m) ground cord	BLUEWS61M , BLUEWS121M and MWS61M, MWS121M	pg. 28
Economy			
Fabric	Adjustable stretch weave fabric band available with 5 ft. (1.5 m) lightweight ground cord, 200,000 flexes, low cost	2272	pg. 28
	Adjustable fabric wrist band with 6 ft. (1.8 m) cord, low cost	ECWS61M-1	pg. 29
Plastic	Adjustable thermoplastic blue wrist band available with 5 ft. (1.5 m) and 10 ft. (3.0 m) lightweight cord, 200,000+ flexes	4620 and 4610 or 4611	pg. 29-30
	Dual conductor adjustable thermoplastic blue wrist band, low cost	4720	pg. 32
Disposable	One-time use	2209	pg. 32

⚠ Warning on all wrist strap products:

A 1 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.

Related Products

Table Mats . . . . . pg. 40

3M™ Adjustable Wrist Strap for Single Conductor Cords

Product No.	Description
2204	Adjustable Fabric Wrist Band made of knitted fabric, in burgundy color.
2214	Adjustable Fabric Wrist Band, in burgundy color, with coiled cord 5 ft. (1.5 m) or 10 ft. (3 m) practical extended length Includes alligator clip

UL LISTED

3M™ Wrist Strap *Premium Performance*
Adjustable Elastic Fabric

Features
- 1/8 in. (4 mm) snap.
- Silver-plated, monofilament elastic band.
- 1 megohm resistor built into ground cord.
- 1 million+ flexes.
- Adjustable, locking clasp.
- UL listed.

Adjustable Wrist Straps provide a comfortable, custom fit. One size adjusts to most any size wrist to provide reliable, 360-degree protection. These wrist straps feature a band made of a silver-plated, monofilament, continuous thread woven together with elastic nylon to allow full conductivity, comfort and reliability, while providing rapid and continuous drain of static charge.

Adjustability also simplifies ordering procedures and inventory control by virtually eliminating the need to order and stock several band sizes. A 1 megohm resistor is built into the ground cord. Available with 1/8 in. (4 mm) snap end. Adjustable bands fit wrist circumference up to 9.0 in. (22.9 cm).

Meets or exceeds the requirements of ANSI/ESD S1.1, ANSI/ESD S20.20, EIA 625, MIL-STD-1686, and MIL-HDBK-263.

3M™ Adjustable Elastic Fabric Wrist Band

3M™ Coiled Cord CC61M

Product No.	Description
WBB-AFWS61M	Fabric Wrist Band, 6 ft. (1.8 m) coiled cord
WBB-AFWS121M	Fabric Wrist Band, 12 ft. (3.7 m) coiled cord
WBB-AFWS	Fabric Wrist Band, Blue/White
CC61M	6 ft. (1.8 m) coiled cord
CC121M	12 ft. (3.7 m) coiled cord
RACC61M	6 ft. (1.8 m) coiled cord, right angle plug (not UL listed)
RACC121M	12 ft. (3.7 m) coiled cord, right angle plug (not UL listed)

UL LISTED

3M™ Wrist Strap *Premium Performance*
Adjustable Elastic Fabric

Features (BAND)
- Machined snap (4 mm) for a reliable connection.
- Soft, hypoallergenic silver-plated band.
- Stainless steel (302 Series) backplate.
- Adjustable, locking clasp.
- UL listed. Date coded for traceability.
- Made in the U.S.A.

This wrist strap set features a fully adjustable, stretch elastic wrist band and a 6 ft. or 12 ft. (1.8 m or 3.7 m) coiled cord. The hypoallergenic, silver-plated band provides 360-degree conductivity around the wrist for maximum skin contact. The band fabric is extra-soft and avoids the scratchy feel of other bands. A machined snap provides a consistent 1 pound removal force. The polyurethane polymer strain relief survives 1 million flexes. Made in the USA. Meets these standards: ANSI/ESD S20.20, EIA 625, MIL-STD-1686, and MIL-HDBK-263.

Features (CORD)
- Polyurethane, high tensile strength coiled cord.
- High quality coiled cord: 1 million+ flexes.
- UL listed (except RACC61M and RACC121M). Date coded for traceability.
- Made in the U.S.A.

3M Products are ESD 20.20 Program Compliant

3M™ Wrist Strap BLUEWS61M

3M™ Wrist Strap *Standard Performance*

Adjustable Elastic Fabric

Features

- 360-degree wrist contact.
- 6 ft. (1.8 m) coiled cord.
- 1/8 in. (4.0 mm) snap.

This wrist strap set features a fully adjustable stretch fabric wrist band and 6 ft. (1.8 m) coiled cord. The band provides 360-degree conductivity around the wrist for maximum skin contact. Band curling is reduced by the woven band fabric. The retractable coiled cord connects to the wrist band via a 1/8 in. (4.0 mm) post snap and contains a 1 megohm resistor. A "spinning style" banana jack reduces cord tangles and improves the cord's life span. Meets the requirements of ANSI/ESD S20.20, EIA 625, MIL-STD-1686, and MIL-HDBK-263. Includes alligator clip. Band available in blue or maroon.

Product No.	Description
BLUEWS61M	Fabric Wrist Band, blue, 6 ft. (1.8 m) coiled cord
BLUEWS121M	Fabric Wrist Band, blue, 12 ft. (3.6 m) coiled cord
BLUEWS	Fabric Wrist Band, blue
BLCC61M	6 ft. (1.8 m) coiled cord
BLCC121M	12 ft. (3.7 m) coiled cord

3M™ Wrist Strap MWS61M

Product No.	Description
MWS61M	Fabric Wrist Band, maroon, 6 ft. (1.8 m) coiled cord
MWS121M	Fabric Wrist Band, maroon, 12 ft. (3.6 m) coiled cord
MWS	Fabric Wrist Band, maroon

3M™ Wrist Strap 2272

3M™ Wrist Strap *Economy Performance*

Adjustable Elastic Fabric

This wrist strap set provides a cost-effective method of grounding personnel. Features a comfortable, adjustable band, a 5 ft. (1.5 m) coiled cord and 1/8 in. (0.3 cm) snap.

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, includes alligator clip

3M Products are ESD 20.20 Program Compliant

Workstation Products

3M™ Wrist Strap ECWS61M-1

3M™ Wrist Strap *Economy Performance*
Adjustable Elastic Fabric

Features

- Meets the requirements of ANSI/ESD S20.20, MIL-STD-1686, and EIA 625.
- Cost-effective design.
- 6 ft. coiled cord.
- 1/8 in. (4 mm) snap.
- Alligator clip included.

This wrist strap set provides a cost-effective means of grounding production staff. Featuring an adjustable fabric wrist band, a 6 ft. (1.8 m) retractable coiled cord and a 1/8 in. (4 mm) snap.

Product No.	Description
ECWS61M-1	Band, 6 ft. (1.8 m) cord

3M™ Wrist Strap 4600 Series shown with ground cord and alligator clip

3M™ Wrist Strap *Economy Performance*
Adjustable Thermoplastic

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 1/8 in. (4.0 mm) snaps and 5 ft. (1.5 m) and 10 ft. (3.0 m) ground cords.

Product No.	Description
4620	Blue Wrist Band with 1/8 in. (4 mm) stud
4650	Blue Wrist Band with 5 ft. (1.5 m) coiled cord

3M™ Metal Wrist Band 2205

3M™ Metal Wrist Band *Premium Performance*
Fixed Size Metal

Metal Wrist Bands 2200 Series 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 user's wrists from 4.5 in. to 6 in. (11.4 cm to 15.2 cm) in circumference; medium for user's wrists from 5.5 in. to 7.25 in. (14.0 cm to 18.4 cm); and large for user's wrists larger than 6.5 in. (16.5 cm). Available with 1/8 in. (4.0 mm) snap end. This product meets the requirements of ESD Standard 1.1, ANSI/ESD S20.20, MIL-STD-1686, MIL-HDBK-263, and EIA 625.

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)

3M™ Wrist Band AMWS

3M™ Wrist Strap *Premium Performance*
Adjustable Metal

Features
- Metal band for durability and easy cleaning.
- Tough outer band coating to protect wearer from electrical hazards.
- Lot coded for traceability.

Made from jewelry-quality stainless steel, our durable metal wrist band creates a superior electrical contact to the user's wrist. The flex-metal style band uses adjustable links to assure a secure and comfortable fit. This product meets the requirements of ESD Standard 1.1, ANSI/ESD S20.20, MIL-STD-1686, MIL-HDBK-263, and EIA 625.

Product No.	Description
AMWS61M	Adjustable Metal Wrist Band, 6 ft. (1.8 m) coiled cord
AMWS121M	Adjustable Metal Wrist Band, 12 ft. (3.6 m) coiled cord
AMWS	Adjustable Metal Wrist Band

3M™ Ground Cord 2210

3M™ Wrist Strap Ground Cords

3M Wrist Strap Ground Cords 2200 and 4600 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. UL listed (2210 and 2220).

Product No.	Description
2210	Ground Cord, coiled 5 ft. (1.5 m) practical extended length. Includes alligator clip.
2220	Ground Cord, coiled 10 ft. (3 m) practical extended length. Includes alligator clip.

UL LISTED

3M™ Ground Cord 4610 (includes alligator clip not shown)

Product No.	Description
4610	Ground Cord, lightweight, coiled, 5 ft. (1.5 m), 4 mm snap end. Includes alligator clip.
4611	Ground Cord, lightweight, coiled, 10 ft. (3 m), 4 mm snap end. Includes alligator clip.

3M Products are ESD 20.20 Program Compliant

Workstation Products

3M™ Dual Conductor Fabric Wrist Band 2368

⚠ 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) becomes damaged, replace ground cord immediately.

3M™ Dual Conductor Fabric Wrist Band for Monitors

Premium Performance

The Dual Conductor Fabric Wrist Band 2368 is used exclusively with all 3M™ Workstation Monitors.

One size adjusts to most 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 1 megohm resistors are built into the ground cord. Adjustability also simplifies ordering procedures and inventory control by virtually eliminating the need to order and stock several band sizes. Also available in metal wrist straps.

Product No.	Description
2368	Dual Conductor Adjustable Fabric Wrist Band, Turquoise
2368VM	Dual Conductor Adjustable Fabric Wrist Band (790 only), Turquoise

Note: The 3M™ Bands and Cords 2300 Series, 2300VM Series and 2200 Series are not interchangeable. See page 26 for additional information on wrist band and cord combinations.

3M™ Metal Wrist Strap 2381

3M™ Dual Conductor Metal Wrist Strap for Monitors

Premium Performance

Product No.	Description
2381	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)
2383	Dual Conductor Metal Wrist Strap Includes band and 5 ft. (1.5 m) cord (Large)
2384	Dual Conductor Metal Wrist Band (Small)
2385	Dual Conductor Metal Wrist Band (Medium)
2386	Dual Conductor Metal Wrist Band (Large)

3M™ Dual Conductor Ground Cords

3M™ Dual Conductor Ground Cord

Premium Performance

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. (6.1 m) practical length
2360R	Dual Conductor Coiled Cord, 5 ft. (1.5 m) practical length, with right angle mono plug connection (To be used only with 3M monitors)
2370R	Dual Conductor Coiled Cord, 10 ft. (3.0 m) practical length, with right angle mono plug connection (To be used only with 3M monitors)
2371R	Dual Conductor Coiled Cord, 20 ft. (6.1 m) practical length, with right angle mono plug connection (To be used only with 3M monitors)

The Dual Conductor Wrist Strap Ground Cord is for use exclusively with 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.

3M™ Wrist Band 4720 with 3M™ Dual Conductor Wrist Strap Ground Cord 2360

3M™ Dual Conductor Thermoplastic Wrist Strap for Monitors

Economy Performance

Features

- High visibility thermoplastic band provides excellent contact area.
- Zipper-style latching mechanism adjusts to any wrist.
- Dual conductor design allows functionality if one wire fails.
- Exclusive "comfort bumps" are designed to allow air flow between band and skin making for more comfortable wear.

Made to be used in conjuction with all 3M™ Workstation Monitors. The Dual Conductor Thermoplastic Wrist Strap offers several unique features to provide high-tech businesses with cutting-edge equipment at a low cost.

The dual conductor wrist band is connected to the 3M™ Workstation or Wrist Strap Monitor via a 3M™ Dual Wire 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 feet (1.5, 3.0 and 6.1 m) lengths respectively.

Product No.	Description
4720	Dual Conductor Wrist Band, Blue (ground cord not included)

3M™ Disposable Wrist Strap 2209

3M™ Disposable Wrist Strap

Economy Performance

Features

- Ideal for single use or short-term use applications.
- Hypoallergenic adhesive.
- 360-degree contact with the skin.
- UL listed.

The Disposable Wrist Strap 2209 is ideally suited for shipment along with components and devices, such as memory upgrades, sound cards, etc., to provide protection at the receiving end.

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

Product No.	Description
2209	Disposable Wrist Strap (Custom envelope imprinting is available) UL listed

2209 Wrist Strap Properties

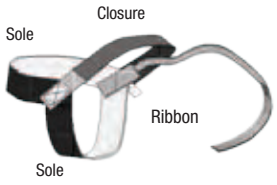
Item	Typical Properties
Ground/Bonding End	Copper foil with conductive adhesive on both attached to conductive ribbon
Conductive Ribbon	Flexible conductive film, with fabricated current limiting resistance near wrist band end. Conductive ribbon enclosed in non-woven adhesive tape.
Wrist Band End	Conductive ribbon with exposed hypoallergenic 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 megohm

3M™ Heel Grounder Product Selection Guide

Heel Grounder Type	Closure Style	Features	Model Number	Page #
Premium				
Cup Style	Black sole, burgundy hook and loop	Moderate heel contact area	2051	pg. 35
	Black hook and elastic loop	Moderate heel contact area	HGC1M	pg. 35
	Black hook and elastic loop, quick clasp	Easy adjustment	HGC1M-C	pg. 36
	Blue non-marking sole, black elastic loop	Non-marking	NS-HGC1M	pg. 35
Front Sole Grounder	Front sole grounder, D-ring, black hook and loop	High contact area	FSG1M-S, M, L	pg. 34
Sole Grounder — Full Coverage	Full coverage sole grounder, D-ring, black hook and loop	Highest contact area	SG1M-S, L, XL	pg. 34
Toe Grounder	Adjustable buckle	Fits high heels	2053	pg. 39
Standard				
Cup Style	D-ring, blue hook and loop	Moderate heel contact area, high visibility	BLUE-HGC1MD	pg. 36
	Blue hook and elastic loop	High visibility, tennis sole	HGC1M-N72-BLU	pg. 36
	Orange hook and loop	High visibility, tennis sole	HGC1M-ORG	pg. 37
Standard Style	Red, D-ring, black hook and loop	Red elastic back	HGS1MD-RED	pg. 37
	Black elastic back	Moderate cost	HGS1M	pg. 37
Toe Grounder	Adjustable buckle, no D-ring at the toe	Fits high heels, low cost	TG1M	pg. 39
Economy				
Cup Style	Black sole, yellow-green hook and loop	High visibility, low cost	2044	pg. 38
	Green hook and loop	High visibility, low cost	HGC1M-ECG	pg. 38
	Black hook and loop	Low cost	HGC1M-EC	pg. 38
Disposable	Adheres to shoe sole	One time use	5402	pg. 39

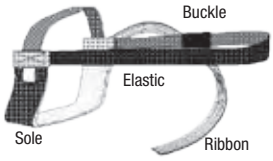
Grounder Styles

Cup Style Grounder
Two soles for double life span.



Standard Grounder
One sole and an elastic back strap.

Toe Grounder
For high heel shoes.



Sole Grounder
The most floor contact area.

3M Heel Grounders comply with ESD SP9.2

Foot Grounder Classification	
Type	**Resistance Range**
A	1 megohm (+20%)
B	35 to 100 megohm
C	< 800 kilohm

Note: A two megohm option is available.

For the Best Heel Grounders, Choose 3M

3M Heel Grounders are designed and manufactured for comfort, durability, and cost-effectiveness. We make all of these grounders in the USA. Our grounders are tested for electrical performance. To be effective, shoe grounders must be worn on both feet.

3M™ Full Coverage Sole Grounder

3M™ Full Coverage Sole Grounder

Premium Performance

Features

- Highest contact area.
- D-ring closure.
- Lot coded.
- Black hook and loop.

This grounder is designed to provide maximum floor contact by covering both the ball of the foot and the heel. Three-point straps allow this grounder to stay in place without uncomfortable over-tightening. This quality grounder is tested for electrical performance and is lot numbered for QC traceability. ESD SP9.2 Type A.

Product No.	Description
SG1M-S	Full Coverage Sole Grounder Assembly, Small
SG1M-L	Full Coverage Sole Grounder Assembly, Large
SG1M-XL	Full Coverage Sole Grounder Assembly, Extra Large

3M™ Front Sole Grounder

3M™ Front Sole Grounder

Premium Performance

Features

- D-ring closure.
- Black hook and loop.
- Lot coded.
- 3-point straps.

This grounder puts the floor contact right where people stand and walk: on the ball of the foot. Three-point straps allow this grounder to stay in place without uncomfortable over-tightening. This quality grounder is tested for electrical performance and is lot numbered for QC traceability. ESD SP9.2 Type A.

Product No.	Description
FSG1M-S	Front Sole Grounder Assembly, Small
FSG1M-M	Front Sole Grounder Assembly, Medium
FSG1M-L	Front Sole Grounder Assembly, Large

Related Products

Combination Wrist Strap and Footwear Tester . . . . . pg. 69

3M™ Heel Grounder – Non-Marking

3M™ Heel Grounder — Non-Marking

Premium Performance

Features

- Virtually no marks on floor.
- Blue sole for visibility.
- 1 megohm resistor.
- Lot coded.
- UL listed.
- Made in U.S.A.

The blue sole virtually eliminates scuff marks on ESD floors and shoes. The reversible, double-life sole is static dissipative. Elastic hook and loop fastener provides a secure, comfortable fit. ESD SP9.2 Type A.

Product No.	Description
NS-HGC1M	Heel Grounder — Non-marking with a 1 megohm resistor

3M™ Shoe Grounder Assembly 2051

3M™ Shoe Grounder Assembly 2051

Premium Performance

Features

- Black sole.
- Burgundy hook and loop.
- 1 megohm resistor.
- Moderate heel contact area.

The Shoe Grounder Assembly 2051 is designed to effectively ground 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 Grounder Assembly 2051 comes with a 1 megohm resistor. ESD SP9.2 Type A.

Product No.	Description
2051	Shoe Grounder Assembly with a 1 megohm resistor

Related Products

Combination Wrist Strap and Footwear Tester . . . . . pg. 69

3M™ Heel Grounder – Cup Style

3M™ Heel Grounder — Cup Style

Standard Performance

Features

- 24 in. (61 cm) ribbon.
- Double life span, 3-layer sole.
- 1 megohm resistor.
- Lot coded.
- UL listed.
- Made in U.S.A.

A full size, double life span sole combines with comfortable elastic hook and loop to make our cup style an industry favorite. This quality grounder features a durable three layer sole, lot number and multi-strand ribbon. ESD SP9.2 Type A.

Product No.	Description
HGC1M	Heel Grounder — Cup Style, 1 megohm resistor

3M™ Heel Grounder – Cup Style, Quick Clasp

3M™ Heel Grounder

Cup Style, Quick Clasp *Standard Performance*

Features

- Fast to attach and remove.
- Remembers last adjustment.
- Elastic strap fits boots.
- Lot coded.
- UL listed.
- 1 megohm resistor.
- Made in U.S.A.

Added to the features of the HGC1M, this grounder uses a push button clasp to make attaching and removing the grounder fast and easy. Adjust the fit the first time and then simply attach the grounder the next time. The soft, elastic nylon strap is designed for comfort. Fits boots and cross trainers. ESD SP9.2 Type A.

Product No.	Description
HGC1M-C	Heel Grounder — Cup Style, Quick Clasp

3M™ Heel Grounder – Cup Style, High Visibility

3M™ Heel Grounder

Cup Style, High Visibility *Standard Performance*

Features

- Blue elastic hook and loop for visibility.
- Double life span, 3-layer sole.
- 1 megohm resistor.
- Lot coded.
- UL listed.
- Made in U.S.A.

Blue elastic hook and loop provides a comfortable, secure fit with good visibility for compliance verification. The durable, double life span tennis sole is made from 3-layer rubber and is designed to not mark shoes. Made in the USA, this quality grounder features UL Listing, a lot number, and a 24 in. (60.9 cm) multi-strand ribbon. ESD SP9.2 Type A.

Product No.	Description
HGC1M-N72-BLU	Heel Grounder — Cup Style, 1 megohm resistor

3M™ Heel Grounder – Cup Style, D-Ring, High Visibility

3M™ Heel Grounder

Cup Style, D-Ring, High Visibility *Standard Performance*

Features

- D-ring for quick no-slip adjustment.
- 1 megohm resistor.
- 24 in. (61.0 cm) ribbon.
- Lot coded.
- UL listed.
- Made in U.S.A.

Features a D-ring for quick, comfortable adjustment, blue hook and loop fastener for improved visibility, and a reversible sole for double life span. Made in the USA, this quality grounder features a durable three-layer sole, lot number, and a 24 in. (60.9 cm) multi-strand ribbon. Fits boots and cross trainers. ESD SP9.2 Type A.

Product No.	Description
BLUE-HGC1MD	Heel Grounder — Cup Style, 1 megohm resistor

Related Products

Combination Wrist Strap and Footwear Tester . . . . . pg. 69
Floor Mats (for heel and toe grounders). . . . . pg. 41

3M Products are ESD 20.20 Program Compliant

Workstation Products

3M™ Heel Grounder, Cup Style, High Visibility

3M™ Heel Grounder — Cup Style, High Visibility

Standard Performance

Features

- Orange hook and loop for visibility.
- Double life span, 3-layer sole.
- 1 megohm resistor.
- Lot coded.
- UL listed.
- Wide sole for better floor contact.
- Made in U.S.A.

Bright elastic orange hook and loop fastener lets you see at a glance who is wearing their heel grounders. Makes heel grounder compliance easy to verify. Made in the USA, this quality grounder features a durable three-layer sole, lot number, and a 24 in. (61.0 cm) multi-strand ribbon. ESD SP9.2 Type A.

Product No.	Description
HGC1M-ORG	Heel Grounder, Wide Sole

3M™ Heel Grounder, Standard Style

3M™ Heel Grounder — Standard Style

Standard Performance

Features

- Black elastic back.
- 24 in. (61.0 cm) multi-strand ribbon.
- Lot coded.
- 1 megohm resistor.
- Made in U.S.A.
- UL listed.

This standard style grounder provides a conductive sole under the heel, and a stretch-nylon strap around the back of the shoe. Made in the USA, this quality grounder features a durable three-layer sole, lot number, and 24 in. (60.9 cm) multi-strand ribbon. ESD SP9.2 Type A.

Product No.	Description
HGS1M	Heel Grounder — Standard Style

3M™ Heel Grounder, Standard Style, High Visibility

3M™ Heel Grounder — Standard Style, High Visibility

Standard Performance

Features

- D-ring closure.
- Black hook and loop, red elastic back.
- 1 megohm resistor.
- Made in U.S.A.

This grounder features a D-ring and elastic hook and loop for full adjustability. Compliance verification is simplified by the bright red elastic strap. ESD SP9.2 Type A.

Product No.	Description
HGS1MD-RED	Heel Grounder — Standard Style, High Visibility

3M™ Heel Grounder Assembly 2044

3M™ Heel Grounder Assembly

Economy Performance

Features

- Yellow-green glow strap for visibility.
- 1 megohm resistor.
- Low cost.
- Made in U.S.A.

The Economy Heel Grounder 2044 is a cup-style heel grounder with a high visibility "yellow glow" strap that helps facility supervisors effectively manage their 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 know that their company is protected against static damage. Designed for dependability and cost-efficiency, the Heel Grounder 2044 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. ESD SP9.2 Type A.

Product No.	Description
2044	Economy Shoe Grounder Assembly with a 1 megohm resistor

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

3M™ Heel Grounder, Cup Style, High Visibility

3M™ Heel Grounder — Cup Style, High Visibility

Economy Performance

Features

- Green hook and loop for visibility.
- 3-layer rubber sole.
- Elastic strap for comfort.
- 1 megohm resistor.
- Lot coded.
- Low cost.
- Made in U.S.A.

Designed to be cost-effective and durable. A double life span, three-layer sole, and 24 in. (61.0 cm) multi-strand ribbon make this grounder a good choice for high volume grounder use. Green hook and loop provides visual verification that heel grounders are being used. The elastic strap offers comfortable adjustability. ESD SP9.2 Type A.

Product No.	Description
HGC1M-ECG	Heel Grounder — Cup Style, Economy High Visibility

3M™ Heel Grounder, Cup Style

3M™ Heel Grounder — Cup Style

Economy Performance

Features

- Green hook and loop for visibility.
- 3-layer rubber sole.
- Elastic strap for comfort.
- 1 megohm resistor.
- Lot coded.
- Low cost.
- Made in U.S.A.

Designed to be cost-effective and durable. A double life span, three-layer sole, 18 in. (45.7 cm) multi-strand ribbon, and a low price make this grounder a good choice when high volume grounder use and turnover is costing too much. ESD SP9.2 Type A.

Product No.	Description
HGC1M-EC	Heel Grounder — Cup Style, Economy

Related Products

Combination Wrist Strap and Footwear Tester . . . . . pg. 69
Floor Mats (for heel and toe grounders). . . . . pg. 41

3M Products are ESD 20.20 Program Compliant

Workstation Products

3M™ Toe Grounder Assembly 2053

3M™ Toe Grounder Assembly

Premium Performance

Features

- Use with high-heeled shoes.
- 12 in. (30.5 cm) conductive ribbon.
- 1 megohm resistor.

Designed for use with high-heeled shoes, the Toe Grounder Assembly 2053 grounds personnel when they are in contact with conductive/dissipative flooring. A comfortable elastic toe strap and 12 in. (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. ESD SP9.2 Type A.

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

3M™ Toe Grounder TG1M

3M™ Toe Grounder

Standard Performance

Features

- Buckle for easy adjustment.
- Elastic strap for comfort.
- 1 megohm resistor.
- Lot coded.
- UL listed.

Fits high heels and other shoes that traditional heel grounders won't. Made in the USA, this quality grounder features a durable three layer sole, lot number, and 12 in. (30.5 cm) multi-strand ribbon. ESD SP9.2 Type A.

Product No.	Description
TG1M	Toe Grounder

3M™ Disposable Heel Grounder 5402

3M™ Disposable Heel Grounder

Economy Performance

Features

- Ideal for one-time or limited use.
- Low cost personnel grounder.
- Bright yellow for visibility.
- Packaged 100 per bag.

The Disposable Foot Grounder 5402 is a low cost personnel grounder that is ideal for one-time or limited use applications. Adhesive at one end of the foot grounder secures it to the bottom of your shoe. The other end tucks inside the heel of the shoe without the need for adhesives or metal clips that might mar the upper part of your shoe. The bright yellow and black stripes makes visual verification simple. Packaged 100 per bag. ESD SP9.2 Type C.

Product No.	Description
5402	Disposable Heel Grounder (100 per bag).

Related Products

Combination Wrist Strap and Footwear Tester . . . . . pg. 69
Floor Mats (for heel and toe grounders). . . . . pg. 41

3M™ Mat Product Selection Guide

Construction	Primary Usage	Features	Color	Model	Rtt	Rtg	Roll (Runner) Widths	Page #
Premium								
2-Layer Rubber	Table	Resistant to heat and most common solvents, excellent electrical properties, superior lay flat characteristics, thickness 0.065 in. (1.7 mm)	Gray, Blue, Green	8800 Series	$1x\ 10^{6}$	5×10^{6}	2 ft., 2.5 ft., 3 ft., 4 ft. (0.6 m, 0.8 m, 0.9 m, 1.2 m)	pg. 41
3-Layer Vinyl	Table	Excellent electrical properties, thickness 0.138 in. (3.5 mm)	Gray, Blue, Brown	8200 Series	4×10^{7}	1×10^{7}	2 ft., 2.5 ft., 3 ft., 4 ft. (0.6 m, 0.8 m, 0.9 m, 1.2 m)	pg. 42
Conductive Plastic/Rubber	Floor	Conductive, resistant to heat and most common solvents, thickness 0.125 in. (3.2 mm)	Black	1864	6×10^{2}	9×10^{2}	2 ft. (0.6 m)	pg. 44
Anti-Fatigue	Floor	Durable rubber "cells" construction, static control and minimize fatigue, thickness 0.625 in. (1.5 mm)	Black	9900 Series	$<1 \times 10^{6}$	$<2 \times 10^{6}$	3 ft. (0.9 m)	pg. 45
Standard								
Ultra R-2 Layer Rubber	Table	Resistant to heat and chemicals, excellent electrical properties, thickness 0.060 in. (1.5 mm)	Gray, Blue, Green	RM (W in. x L in.) L2RGR RM (W in. x L in.) L2RBL RM (W in. x L in.) L2RGN	1×10^{6}	1×10^{7}	2 ft., 2.5 ft., 3 ft., 4 ft. (0.6 m, 0.8 m, 0.9 m, 1.2 m)	pg. 43
3-Layer Vinyl	Table	Excellent electrical properties, thickness 0.125 in. (3.2 mm)	Gray, Blue	TM (W in. x L in.) L3GR TM (W in. x L in.) L3BL	1×10^{7}	1×10^{7}	2 ft., 2.5 ft., 3 ft., 4 ft. (0.6 m, 0.8 m, 0.9 m, 1.2 m)	pg. 43
Economy								
1-Layer Vinyl	Table and Floor	Good lay flat characteristics, low cost, thickness 0.093 in. (2.4 mm) Not compatible with monitors	Gray, Blue	TM (W in. x L in.) L1GR TM (W in. x L in.) L1BL	$1 \times 10^{9\text{-}10}$	$1 \times 10^{9\text{-}10}$	2 ft., 2.5 ft., 3 ft., 4 ft. (0.6 m, 0.8 m, 0.9 m, 1.2 m)	pg. 43
Conductive Rubber	Floor	Conductive, resistant to heat and solvents, thickness 0.060 in. (1.5 mm), low cost	Black	COND (W in. x L in.) FM	$1 \times 10^{5\text{-}6}$	$1 \times 10^{5\text{-}6}$	2 ft., 3 ft., 4 ft. (0.6 m, 0.9 m, 1.2 m)	pg. 44
Anti-Fatigue	Floor	Foamed vinyl, static control and minimize fatigue, thickness 0.375 in. (9.5 mm)	Brown, Gray	AFM (W in. x L in.) L1VBR AFM (W in. x L in.) L1VGR	$1 \times 10^{9\text{-}10}$	$1 \times 10^{9\text{-}10}$	3 ft. (0.9 m)	pg. 46

Cut Mats or Rolls, 3M Provides Excellent Worksurfaces

Whether you need a worksurface that can handle solder and solvents, or an anti-fatigue mat for comfort, 3M Table and Floor Mats provide the static control and mechanical performance to fit your application. All 3M matting, with the exception of the 9900 Series, is available in rolls. Most materials are available in 2 ft., 2.5 ft., 3 ft. or 4 ft. (0.6 m, 0.76 m, 0.9 m, 1.2 m) widths. 3M also supplies the accessories you need to install the mats you cut, including snaps, snap tool, ground cords, mat cleaner and test meter. 3M can custom-cut mats to the sizes you need.

Get Worksurface Support Items from 3M

3M™ Snap Tool

3M™ Test Kit 701

3M™ Ground Cord 3040/3048

3M™ Surface Mark Remover 8001

3M Products are ESD 20.20 Program Compliant

3M™ Static Dissipative Rubber Mat

Meets the requirement of ESD Standard 4.1, ESD Standard 20.20, EIA 625, MIL-HDBK-263, and MIL-STD-1686. RTG: 10^7 ohm; RTT: 10^7; Thickness: .065 in. Compatible with constant monitors.

3M™ Dissipative Rubber Mats and Rolls 8800 Series

Premium Performance

Dissipative Rubber Mats and Rolls 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. Compatible with constant monitors.

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)	5 x 10^6 ohm
(Surface-to-Surface)	1 x 10^6 ohm

Product No.	Description	Size, ft.	(m)
These kits come with one 15 ft. (4.6 m) 3M™ Ground Cord 3040 and two 3M™ Snap Fasteners 3034, installed			
8870	Floor Mat, Gray	4 x 6	(1.2 x 1.8)
8871	Floor Mat, Blue	4 x 6	(1.2 x 1.8)
8872**	Floor Mat, Green	4 x 6	(1.2 x 1.8)
These kits come with two 15 ft. (4.6 m) 3M Ground Cords 3040 and five 3M Snap Fasteners 3034, not installed			
8880	Floor Roll, Gray	4 x 24	(1.2 x 7.3)
8881	Floor Roll, Blue	4 x 24	(1.2 x 7.3)
These kits come with two 3M Snap Fasteners 3034 and one 3M™ Wrist Strap Grounding System 3048			
8810	Table Mat, Gray	2 x 4	(0.6 x 1.2)
8811	Table Mat, Blue	2 x 4	(0.6 x 1.2)
8812**	Table Mat, Green	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)
8832**	Table Mat, Green	3 x 4	(0.9 x 1.2)
88A0	Table Mat, Gray	2 x 3	(0.6 x 0.9)
88A1	Table Mat, Blue	2 x 3	(0.6 x 0.9)
88A2**	Table Mat, Green	2 x 3	(0.6 x 0.9)
These kits come with two 15 ft. (4.6 m) 3M Ground Cords 3040 and five 3M Snap Fasteners 3034, not installed			
8840	Table Roll, Gray	2 x 24	(0.6 x 7.3)
8841	Table Roll, Blue	2 x 24	(0.6 x 7.3)
8842**	Table Roll, Green	2 x 24	(0.6 x 7.3)
8860	Table Roll, Gray	3 x 24	(0.9 x 7.3)
8861	Table Roll, Blue	3 x 24	(0.9 x 7.3)
8862**	Table Roll, Green	3 x 24	(0.9 x 7.3)
These mats do not come with additional hardware			
8800	Table Roll, Gray	2 x 40	(0.6 x 12.2)
8801	Table Roll, Blue	2 x 40	(0.6 x 12.2)
8820	Table Roll, Gray	2.5 x 40	(0.8 x 12.2)
8821	Table Roll, Blue	2.5 x 40	(0.8 x 12.2)
8822**	Table Roll, Green	2.5 x 40	(0.8 x 12.2)
8850	Table Roll, Gray	3 x 40	(0.9 x 12.2)
8851	Table Roll, Blue	3 x 40	(0.9 x 12.2)
8852**	Table Roll, Green	3 x 40	(0.9 x 12.2)
8890	Floor Roll, Gray	4 x 40	(1.2 x 12.2)
8891	Floor Roll, Blue	4 x 40	(1.2 x 12.2)

Non-standard sizes available on custom order basis up to 50 ft. (15.2 m) maximum length.

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

** Note: Green mat table/runner identifies work surface as a lead-free area.

3M™ Dissipative Vinyl Three-Layer Mats 8200 Series

3M™ Dissipative Vinyl Three-Layer Mats and Rolls 8200 Series *Premium Performance*

Mats and Rolls 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. Non-standard sizes are available on a custom order basis. Compatible with constant monitors.

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 x 10^7 ohm
(Surface-to-Surface)	4 x 10^7 ohm

* 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. (15.2 m) maximum length.

Related Products

Wrist Straps . . . . . pg. 26
Heel Grounders . . . . . pg. 33
Static Control Surface Mark Remover . . . . . pg. 52

Product No.	Description	Size, ft.	(m)
These kits come with one 15 ft. (4.6 m) 3M™ Ground Cord 3040 and two 3M™ Snap Fasteners 3050, installed			
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)
These kits come with two 15 ft. (4.6 m) 3M Ground Cords 3040 and two 3M Snap Fasteners 3050, not installed			
8251	Floor Roll, Brown	4 x 24	(1.2 x 7.3)
8253	Floor Roll, Gray	4 x 24	(1.2 x 7.3)
8254	Floor Roll, Blue	4 x 24	(1.2 x 7.3)
These kits come with one 3M™ Wrist Strap Grounding System 3048 and two 3M Snap Fasteners 3050, installed			
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)
8221	Table Mat, Brown	2 x 3	(0.6 x 0.9)
8223	Table Mat, Gray	2 x 3	(0.6 x 0.9)
8224	Table Mat, Blue	2 x 3	(0.6 x 0.9)
These kits come with two 15 ft. (4.6 m) 3M Ground Cords 3040 and two 3M Snap Fasteners 3050, not installed			
8261	Table Roll, Brown	2 x 24	(0.6 x 7.3)
8263	Table Roll, Gray	2 x 24	(0.6 x 7.3)
8264	Table Roll, Blue	2 x 24	(0.6 x 7.3)
These mats do not come with additional hardware			
8231	Table Roll, Brown	2 x 50	(0.6 x 15.2)
8233	Table Roll, Gray	2 x 50	(0.6 x 15.2)
8234	Table Roll, Blue	2 x 50	(0.6 x 15.2)
8241	Table Roll, Brown	2.5 x 50	(0.8 x 15.2)
8243	Table Roll, Gray	2.5 x 50	(0.8 x 15.2)
8244	Table Roll, Blue	2.5 x 50	(0.8 x 15.2)
8271	Table Roll, Brown	3 x 50	(0.9 x 15.2)
8273	Table Roll, Gray	3 x 50	(0.9 x 15.2)
8274	Table Roll, Blue	3 x 50	(0.9 x 15.2)
82A1	Floor Roll, Brown	4 x 50	(1.2 x 15.2)
82A3	Floor Roll, Gray	4 x 50	(1.2 x 15.2)
82A4	Floor Roll, Blue	4 x 50	(1.2 x 15.2)
8281	Table Roll, Brown	2 x 40	(0.6 x 12.2)
8283	Table Roll, Gray	2 x 40	(0.6 x 12.2)
8284	Table Roll, Blue	2 x 40	(0.6 x 12.2)
8291	Floor Roll, Brown	4 x 40	(1.2 x 12.2)
8293	Floor Roll, Gray	4 x 40	(1.2 x 12.2)
8294	Floor Roll, Blue	4 x 40	(1.2 x 12.2)

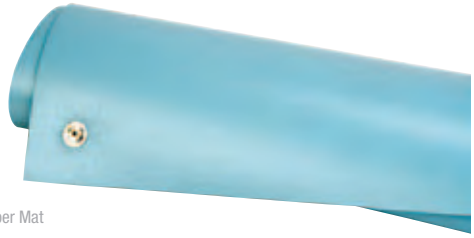
The requirements of ESD Standard 4.1, ESD Standard 20.20, EIA 625, MIL-HDBK-263, and MIL-STD-1686. RTG: 10^7 ohm; RTT: 10^7; Thickness: .0125 in. Compatible with Constant Monitors.

3M Products are ESD 20.20 Program Compliant

Workstation Products

3M™ Ultra-R2 Rubber Mat *Standard Performance*

Two Layer



3M™ Ultra-R2 Rubber Mat

Excellent resistance to solvents, hot solder and soldering irons makes the Ultra-R2 mat an excellent static safe work surface. Excellent electrical performance is provided by using a two-layer combination of static dissipative and conductive rubber materials. Ultra-R2 mats combine the low contact resistance and convenience of soft mats, and the conductivity and durability of hard laminates. Meets the requirements of ESD Standard 4.1, ESD Standard 20.20, EIA 625, MIL-HDBK-263, and MIL-STD-1686. RTG: 10^6 ohm; RTT: 10^7 ohm; Thickness: 0.060 in. (1.5 mm). Compatible with constant monitors.

3M™ Mat Kits

Includes mat, two snaps, installed, and a 15 ft. (4.5 cm) ground cord

Size	Blue P/N	Gray P/N	Green P/N
24 in. x 36 in. (60.1 cm x 91.4 cm)	RM2436L2RBL-L	RM2436L2RGR-L	RM2436L2RGN-L
24 in. x 48 in. (60.1 cm x 121.9 cm)	RM2448L2RBL-L	RM2448L2RGR-L	RM2448L2RGN-L
Rolls/Runners Does not include ground cords			
2 ft. x 50 ft. (0.6 m x 15.2 m)	RM24600L2RBL	RM24600L2RGR	RM24600L2RGN
3 ft. x 50 ft. (0.9 m x 15.2 m)	RM36600L2RBL	RM36600L2RGR	RM36600L2RGN
2.5 ft. x 50 ft. (0.8 m x 15.2 m)	RM30600L2RBL	RM30600L2RGR	NA
4 ft. x 50 ft. (1.2 m x 15.2 m)	RM48600L2RBL	RM48600L2RGR	RM48600L2RGN

Call for custom sizes.
Use green mats to indicate lead-free work areas.

3M™ Dissipative Vinyl Mat *Standard Performance*

Three-Layer

3M™ Dissipative Vinyl Mat

This three-layer vinyl mat provides excellent electrical properties. The top layer is tough, easy to clean, dissipative vinyl. The center layer, a highly conductive metal scrim, moves the charge from the surface to ground quickly. The bottom layer is a durable, non-skid cushion of dissipative foam. While not as durable as the two-layer rubber material, this three-layer vinyl is designed to be cost effective. Meets the requirements of ESD Standard 4.1, ESD Standard 20.20, EIA 625, MIL-HDBK-263, and MIL-STD-1686. RTG: 10^7 ohm; RTT: 10^7 ohm; Thickness: 0.125 in. (3.2 mm). Compatible with constant monitors.

3M™ Mat Kits

Includes mat, two snaps, installed, and a 15 foot ground cord

Size	Blue P/N	Gray P/N
24 in. x 36 in. (60.1 cm x 91.4 cm)	TM2436L3BL-L	TM2436L3GR-L
24 in. x 48 in. (60.1 cm x 121.9 cm)	TM2448L3BL-L	TM2448L3GR-L
Rolls/Runners Does not include ground cords		
2 ft. x 50 ft. (0.6 m x 15.2 m)	TM24600L3BL	TM24600L3GR
3 ft. x 50 ft. (0.9 m x 15.2 m)	TM36600L3BL	TM36600L3GR
2.5 ft. x 50 ft. (0.8 m x 15.2 m)	TM30600L3BL	TM30600L3GR
4 ft. x 50 ft. (1.2 m x 15.2 m)	TM48600L3BL	TM48600L3GR

Call for custom sizes.

3M™ Vinyl Mat *Economy Performance*

Homogeneous

3M™ Vinyl Mat

One-layer static dissipative vinyl for good electrical properties and long wear. Meets the requirements of MIL-HDBK-263 and MIL-STD-1686. RTG: 10^9-10^{10} ohm; RTT: 10^9-10^{10} ohm; Thickness: 0.093 in. (2.4 mm).
Not compatible with workstation monitors.

3M™ Mat Kits

Includes mat, two snaps, installed, and a 15 foot ground cord

Size	Blue P/N	Gray P/N
24 in. x 36 in. (60.1 cm x 91.4 cm)	TM2436L1BL-L	TM2436L1GR-L
24 in. x 48 in. (60.1 cm x 121.9 cm)	TM2448L1BL-L	TM2448L1GR-L
Rolls/Runners Does not include ground cords		
2 ft. x 50 ft. (0.6 m x 15.2 m)	TM24600L1BL	TM24600L1GR
3 ft. x 50 ft. (0.9 m x 15.2 m)	TM36600L1BL	TM36600L1GR
2.5 ft. x 50 ft. (0.8 m x 15.2 m)	TM30600L1BL	TM30600L1GR
4 ft. x 50 ft. (1.2 m x 15.2 m)	TM48600L1BL	TM48600L1GR

Call for custom sizes. All mat kits are also available without the kit accessories.

3M Products are ESD 20.20 Program Compliant

3M™ Floor Mat 1864

3M™ Conductive Floor Mat for Hard Floors

Premium Performance

The main purpose of a conductive floor mat or roll is to remove static charge from personnel as they approach work areas. 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

This semi-flexible conductive floor mat 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.

3M™ Floor Roll 1864R

The Floor Roll 1864R is a 50 ft. long roll. 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.

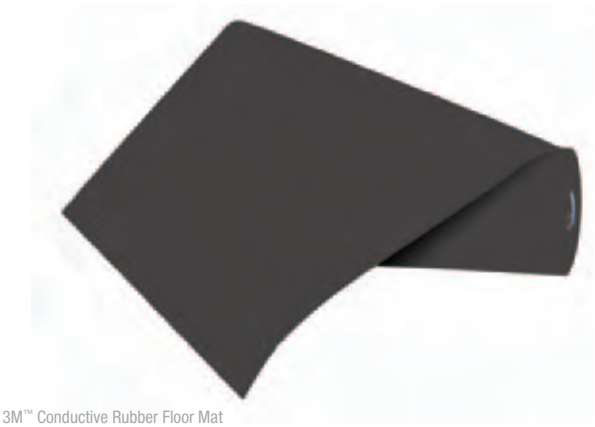
Product No.	Description	Size, ft.	(m)
1864	Floor Mat, 0.125 in. (3.2 mm) thick	4 x 6 4 x 8	(1.2 x 1.8) (1.2 x 2.4)
1864R	Floor Roll, 0.125 in. (3.2 mm) thick	2 x 50	(0.6 x 15.2)

Conductive Floor Mats 1864 are black. Non-standard 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)	9 x 10^2 ohm
(Surface-to-Surface)	6 x 10^2 ohm
****Resistivity**	10^2 ohm-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



3M™ Conductive Rubber Floor Mat

3M™ Conductive Rubber Floor Mat

Economy Performance

Homogeneous

Homogenous conductive rubber construction provides resistance to wear, hot solder, oil grease, and solvents. This mat's conductive resistance value provides rapid discharge from personnel wearing heel grounders. The low profile reduces trip hazard and is preferred for use with rolling carts or chairs. Mat can be reversed for double usage. ESD Standard S20.20, EIA 625, MIL-HDBK-263, and MIL-STD-1686. RTG: 10^5 ohm; RTT: 10^5 ohm; Thickness: 0.060 in. (1.5 mm)

Mat Kits Includes mat, two snaps (installed), and a 15 ft. (4.6 cm) ground cord

Size	Black P/N
48 in. x 72 in. (121.9 cm x 182.9)	COND4872FM-F

Rolls/Runners Does not include ground cords.

2 ft. x 50 ft. (0.6 m x 15.2 m)	COND24600FM
3 ft. x 50 ft. (0.9 m x 15.2 m)	COND36600FM
4 ft. x 50 ft. (1.2 m x 15.2 m)	COND48600FM

Call for custom sizes.

3M™ Anti-Fatigue Mat *Premium Performance*

3M™ Anti-Fatigue Mat 9910

Static Control Anti-Fatigue Mats allow workers to stand comfortably for long periods while minimizing the fatigue associated with standing work. Manufactured from durable rubber, 3M Anti-Fatigue Mats consist of a matrix of hollow cylinders that function like a spring when compressed. These mats are designed to provide a durable cushion that offers secure, stable footing and a unique energizing responsiveness.

Their structure provides a stable surface supported by rubber cells that soften in response to surface activity. These cells provide an effective cushioning solution because the 3M Static Control Anti-Fatigue Mats get softer as compressed, not harder like products made of foam.

Product No.	Description
9900	Static Control Anti-Fatigue Mat 3 ft. W x 5 ft. L (0.9 m x 1.5 m)
9910	Static Control Anti-Fatigue Roll. 3 ft. (0.9 m) x custom length
9920	Static Control Anti-Fatigue Mat. 22 in. (55.9 cm) octagonal shape

* These products ship with two 15 ft. (55.9 cm) 3M™ Ground Cords 3040, five 3M™ Snap Fasteners 3034 (not installed and a 3M™ Snap Fastener Installation Tool.

Properties

Property	Typical Value
Size	Standard: 3 ft. W x 5 ft. L (0.9 m and 1.5 m) and octagonal 22 in. (55.9 cm) diameter. rolls: 3 ft. (0.9 m) width x custom length
Thickness	0.625 in. (1.55 cm) with beveled edge
Durometer	42 Shore A
Weight	2 lbs. per square ft.
Composition	SBR rubber polymers
Flammability	NFPA Rating (Scale 1–4) Fire: 1
Cleaning	Sweep, vacuum or damp mop
Color	Black
Edges	Solid molded rubber
*Resistance Surface to Surface Surface to Ground	 <1 x 10^6 ohm <2 x 10^6 ohm (when connected through 3M™ Ground Cord 3040)
Coefficient of Friction	Greater than 1.0 C.O.F.
Temperature Use Range	-40°F to 180°F (-40°C to 82°C)
Chemical Resistance	Water — Excellent Acids — Fair-Good Alkali — Fair Alcohols — Good Oils & Gasoline — Poor Aliphatic Hydrocarbons — Poor Aromatic Hydrocarbons — Poor

* Tested per ESD STMS7.1 at 72°F, 12% RH on 3 ft. x 5 ft. (0.9 m x 1.5 m) mat

3M™ Vinyl Anti-Fatigue Mat *Economy Performance*

3M™ Vinyl Anti-Fatigue Mat

This 3/8 in. (9.5 mm) thick foamed vinyl mat provides relief and comfort for personnel that must stand or walk for long periods. Embossing improves traction. Supresses voltage on personnel as they approach a work area. Mats feature a beveled edge.

Mats

Size	Gray P/N	Brown P/N
24 in. x 36 in. (60.1 cm x 91.4 cm)	AFM2436L1VGR	AFM2436L1VBR
36 in. x 60 in. (91.4 cm x 152.4 cm)	AFM3660L1VGR	AFM3660L1VBR

Mat Kits

Includes mat, two snaps (installed), and a 15 ft. (4.6 m) ground cord.

Size	Gray P/N	Brown P/N
24 in. x 36 in. (60.1 cm x 91.4 cm)	AFM2436L1VGR-F	AFM2436L1VBR-F
36 in. x 60 in. (91.4 cm x 152.4 cm)	AFM3660L1VGR-F	AFM3660L1VBR-F

Rolls

3 ft. x 60 ft. (0.9 m x 18.3 m)	AFM36720L1VGR	AFM36720L1VBR

Call for custom sizes.

Specifications

Resistance-to-Ground point (RTG): 10^9 - 10 ohms
Resistance Top-to-Top (RTT): 10^9 - 10 ohms
Thickness: 0.375 inches

3M Products are ESD 20.20 Program Compliant

3M™ Dissipative Hard Laminate Sheets

3M™ Dissipative Hard Laminate Sheets

Product No.	Color	Size, ft.	(m)
8360	Beige	3 x 12 5 x 12	(0.9 x 3.7) (1.5 x 3.7)
8365	Gray	3 x 12 5 x 12	(0.9 x 3.7) (1.5 x 3.7)
8375	White	5 x 12	(1.5 x 3.7)

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) virtually 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. (1.27 cm) radius is possible, which allows installation without seams in corners and over rounded edges when forming parallel to sanding lines. The laminate provides a comfortable rounded front on which personnel can rest their arms. It is resistant to common solvents and to hot solder droppings.

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

Properties

Property	Typical Value
Thickness	0.037 in. (0.9 mm)
Hardness **Abrasion resistance:**	> 1500 cycles Tabor Wheel 32
***Resistance**	
(Surface to Ground)	7 x 10^6 ohm
(Surface to Surface)	6 x 10^7 ohm

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

Related Products

Wrist Straps . . . . . pg. 26
Monitors . . . . . pg. 59
Static Control Surface Mark Remover . . . . . pg. 52

3M™ Dissipative Rigid Worksurfaces

3M™ Dissipative Rigid Worksurface 8300 Series

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.

Product No.	Color	Size, in.	(cm)
8343	Beige	0.125 x 24 x 36	(0.32 x 61.0 x 91.4)
8344	Gray	0.125 x 24 x 36	(0.32 x 61.0 x 91.4)
8353	Beige	0.125 x 24 x 48	(0.32 x 61.0 x 121.9)
8354	Gray	0.125 x 24 x 48	(0.32 x 61.0 x 121.9)

Non-standard sizes and colors are also available, subject to minimum order quantity.

3M™ Clean Walk Mat

3M™ Clean Walk Mat 5830

Clean Walk Mats 5830 are designed to 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.

Product No.	Description
5830	Clean Walk Mat, 30 mats per pad Size, in. (cm) 18 x 36 (45.7 x 91.4) 18 x 45 (45.7 x 114.3) 25 x 45 (63.5 x 114.3)

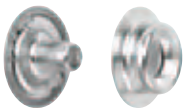
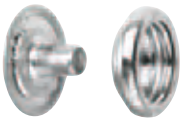
3M™ Ground Cord Product Selection Guide

Features	Model	Page #
Premium		
Ground Cord, 15 ft. (4.6 m) with 10 mm snap, connects mats to building ground, integral 1 megohm resistor	3040	pg. 49
Ground Kit for 3M Static Dissipative Laminate, 10 ft. (3.0 m) cord, integral 1 megohm resistor	3041	pg. 49
Common Point Grounding System for 2 wrist straps, 10 ft. (3.0 m) cord	3042	pg. 49
Interconnect Mat Cord, 5 ft. (1.5 m) with 10 mm snap at each end, connects mats to each other	3043	pg. 49
Common Point Grounding System for workstation components, single-row, six terminal strip, 10 ft. (3.0 m) ground cord, integral 1 megohm resistor	3047	pg. 49
Common Point Grounding System for 2 wrist straps and table mat, 15 ft. (4.6 m) cord, 10 mm snap, integral 1 megohm resistor	3048	pg. 49
Economy		
Ground Cord, 15 ft. (4.6 m) with 10 mm snap, connects mats to building ground, integral 1 megohm resistor, low cost	FGC151M	pg. 49
Common Point Grounding System for 2 wrist straps and table mat, 15 ft. (4.6 m) cord, 10 mm snap, integral 1 megohm resistor, low profile, low cost	LPCGC151M	pg. 49
Metal Grounding Block Common Point Grounding System for 2 wrist straps, 10 ft. (3.0 m) cord, low cost	WSGR2	pg. 50
Common Point Grounding System for two wrist straps and table mat, 15 ft. (4.6 m)	CGC151M	pg. 49

3M™ Grounding Accessories

Image	Product No.	Description
Cords		
	3047	Common Point Grounding System, 10 ft. (3.0 m) 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 3M™ 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.
	LPCGC150M LPCGC151M	This low profile common point ground cord is less obtrusive in the work area. The system connects two wrist straps and a work surface to ground. Holes are provided for permanent mounting to a bench. Available with either a 3/8 in. (9.5 mm) stud or socket that securely snaps the cord to the mat. A ring terminal connects the opposite end of the 15 ft. (4.6 m) cord to ground.
	CGC151M	Common Point Grounding System for two wrist straps and table mat 15 ft. (4.6 m)
	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.
	2380 2380D	Monitor/table mat replacement cord, 6 ft. (1.8 mm), with 10.0 mm snap. This cord does not have a resistor molded into the red snap fastener cap. Monitor/table mat replacement cord, 6 ft. (1.8 mm), with 10.0 mm snap. Extends from the 3M™ Wrist Strap Workstation Monitor 724 to the static control worksurface to be monitored. Includes a diode molded into the blue snap fastener cap.
	2389	Monitor/Table Mat Interconnect Cord, 10 ft. (3.0 m), with 10.0 mm snap. A straight cord with male snap fasteners at each end and no resistors. Used to interconnect two monitored worksurfaces.
	3040	Ground Cord, 15 ft. (4.6 m), with 10.0 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.
	3041	Grounding Kit for 3M™ 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 10.0 mm snap. Molded-in male snap fastener at each end. Connects all static control mats and runners to each other. Ground cord has a 1 megohm resistor.
	FGC150M FGC151M	The low profile beveled cap prevents the cord from being accidentally removed from the mat. A 3/8 in. (9.5 mm) stud securely snaps to the mat, and at the other end of the 15 ft. (4.6 m) cord is a ring terminal.

3M™ Grounding Accessories

Image	Product No.	Description
Snaps		
	3050	Snap Fastener, female, 10.0 mm diameter. For 3M™ Table and Floor Mats and Runners 8200 Series.
	SNAPTOOL	This simple-to-use tool attaches snaps to static mats. Three easy steps give you a secure snap with good electrical connection. Rugged and rust resistant, the snap tool allows you to put a grounding snap right where you need it.
	SNAPSOCKET3/8	Socket snaps are held in place by crimping the tip of an eyelet through the center of the socket with a snap tool. This traps the mat between the socket on the top of the mat and the eyelet on the back of the mat. 10 sockets and eyelets are included in each pack. Use with SNAPTOOL.
	SNAPSTUD3/8	Stud snaps are held in place by crimping the tip of an eyelet through the center of the stud with a snap tool. This traps the mat between the stud on the top of the mat and the eyelet on the back of the mat. 10 studs and eyelets are included in each pack. Use with SNAPTOOL.
	FPSNAP	Prong clinch snaps are held in place by putting the prongs through the mat and crimping them on the bottom of the mat. No special tools are needed.
	**3033**	Snap Fastener, male, 0.125 in. (0.3 cm) hole, 10.0 mm diameter. For mats and runners. 1800/8800 Series.
	**3034**	Snap Fastener, female, 0.125 in. (0.3 cm) hole, 10.0 mm diameter. For 3M™ Mats and Runners 1800/8800 series.
Clips		
	3037	Insulated Bulldog Clip. Fits standard banana plug.
	3038	Uninsulated Alligator Clip. Fits standard banana plug.
Ground Block		
	WSGR2	This metal grounding block accommodates two wrist straps and comes complete with mounting hardware. Designed to be mounted under the bench and keep the wrist strap connections safe. The integral 15 ft. (4.6 m) cord ends with a ring terminal. Two 4 mm parking studs hold coiled cords to reduce damage to cords left at the bench. No resistor.
Soldering Tool		
	SP3010	The 3M Soldering Tool will help you form component leads, probe circuit cards, and chase wire and leads. Tough glass-filled nylon plastic makes this tool durable and long lasting.
Stack Jack		
	STACKJACK	The Stacking Banana Jack Adapter connects a mat to a banana jack. Connect a wrist strap, ground cord or constant monitor. Great for grounding mats on carts. Multiple jacks can be snapped together for more banana jacks.

Notes

3M™ Worksurface Cleaning Products

3M™ Static Control Surface Mark Remover 8001

Product No.	Description
8001	Surface Mark Remover Size: 1 quart spray (32 oz.) Shelf-life: two years

Features

- Clear, clean, fresh scent
- Maintains 1x1 11 ohm/sq. (for extended period of time in both 55% RH environments and dry 13% RH)
- No rinsing required
- Leaves no tacky residue

The Static Control Surface Mark Remover 8001 is an extra-strength fluid that is designed to remove ordinary dirt and grime as well as difficult spots and stains from most types of static control surfaces, such as table mats, floor mats, hard-laminate benchtops, portable field-service kit work surface, etc.

3M™ Topical Antistatic Spray

Staticide is a safe, easy-to-use, topical antistatic solution that can be applied to walls, ceilings, floors, carpets, fixtures, worksurfaces, tools, equipment, conveyor belts, clothing, and other materials to render them non-static generating. Meets the requirements for topical antistats as required in MIL-HDBK-263. Available in 1 quart spray bottle or 1 gallon jug.

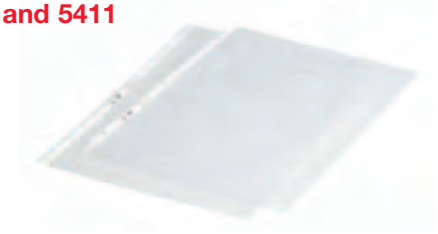
Product No.	Description
ANTISTAT1QT or ANTISTAT1GAL	Topical Antistat Spray Size: 1 quart spray (32 oz.) 1 gallon jug

3M™ Static Safe Hand Lotion

This static dissipative, non-contaminating lotion keeps skin moist for better contact between the wrist strap and the skin, as recommended by MIL-HDBK-263. Available in 8 oz. or 1 gallon plastic bottles.

Product No.	Description
LOTION8OZ or LOTION1GAL	Static Safe Hand Lotion Size: 8 oz. 1 gallon

3M™ Static Dissipative Sheet Protectors 5410 and 5411



3M™ Static Dissipative Sheet Protectors 5410 and 5411

Static Dissipative Sheet Protectors 5410 and 5411 are non-static generating while at the same time protecting documents that are placed into the sheet protector. This product is designed for ESD controlled areas where there are ESD sensitive devices. Available in 8.5 in. x 11 in. and A4 European versions.

Product No.	Description
5410	Static Dissipative Sheet Protector, 8.5 in. x 11 in. pages
5411	Static Dissipative Sheet Protector, A4 European Version

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 provide 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 with a static dissipative portable field service kit from 3M.

3M™ Field Service Kit Product Selection Guide

Features	Model	Page #
Premium		
Portable, 22 in. x 24 in. (55.9 cm x 61.0 cm), static dissipative, red worksurface, includes 3M™ Wrist Strap Monitor 725 and dual conductor wrist strap	8507	pg. 54
Portable, 15 in. x 20 in. (38.1 cm x 50.8 cm), static dissipative, red, lightweight worksurface, includes adjustable fabric wrist strap and grounding accessories	8505	pg. 53
Standard		
Portable, 22 in. x 24 in. (55.9 cm x 61.0 cm), static dissipative, red worksurface, includes adjustable fabric wrist strap and grounding accessories	8501	pg. 54
Economy		
Portable, 24 in. x 24 in. (61.0 cm x 61.0 cm), static dissipative, red worksurface, includes adjustable fabric wrist strap and grounding accessories, low cost	FSKL3RD	pg. 54

3M™ Portable Field Service Kit *Premium Performance*

3M™ Portable Field Service Kit 8505

The 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.

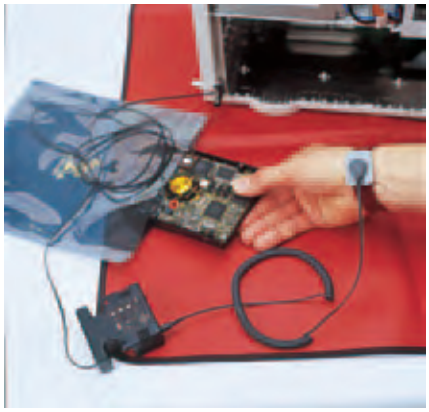
Product No.	Description
8505	Lightweight Portable Field Service Kit Kit contains: • Static Dissipative Worksurface with Pocket 0.015 H x 15 W x 20 L in. (0.34 mm x 38.1 cm x 51.0 cm) • 3M™ Adjustable Wrist Band 2204 • Lightweight Coiled Ground Cords: 3M™ Wrist Strap Ground Cord 2240, 5 ft. (1.5 m) 3M™ Extension Ground Cord 2243, 5 ft. (1.5 m) 3M™ Worksurface Ground Cord 3063, 5 ft. (1.5 m) • 3M™ Alligator Clip 3038

Custom logo imprinting on the worksurface is available.

Properties

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

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



3M™ Portable Field Service Kit 8507

3M™ Portable Field Service Kit *Premium Performance*

The Portable 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.

Product No.	Description
8507	Portable Field Service Kit includes Wrist Strap Monitor 725 and Dual Conductor Wrist Strap Kit contains: • Static Dissipative Worksurface, foldable, 0.021 H x 22 W x 24 L in. (0.5 mm x 55.9 cm x 61.0 cm) red with gray cotton edging. Two pockets, each 8 in. x 11 in. (20.3 cm x 28.0 cm), ground snap. • 3M™ Wrist Strap Monitor 725, 2.5 H x 2.6 W x 1.1 L in. (6.4 x 6.6 x 2.8 cm), black. Battery-powered, 9 V (not included). Ground cord, 6 ft. (1.8 m), with ground clip. Ground snap on unit to connect to the worksurface. • 3M™ Dual Conductor Adjustable Fabric Wrist Band 2368 • 3M™ Dual Conductor Coiled Cord 2370, 10 ft. (3.0 m)

3M™ Portable Field Service Kit 8501

3M™ Portable Field Service Kit *Standard Performance*

The Portable Field Service Kit 8501 is designed to provide 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.

Product No.	Description
8501	Static Dissipative Portable Field Service Kit Kit includes: • Static Dissipative Worksurface 0.021 H x 22 W x 24 L in. (0.5 mm x 55.9 x 61.0 cm) • 3M™ Ground Cord Assembly 3051 • 3M™ Alligator Clip 3038 • 3M™ Adjustable Wrist Band 2204

Custom logo imprinting on the worksurface is available.

Properties

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

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

3M™ Field Service Kit FSKL3RD

3M™ Field Service Kit *Standard Performance*

This Field Service Kit provides a complete, portable, static safe workstation for personnel working with electronics in the field. To stop static electricity from damaging electronic cards, a static safe work area is essential for field service technicians performing in-field repair or installation of cards. The Field Service Kit is used by technicians in telecommunications, computer, industrial controls and business equipment service applications. The entire kit folds to fit into most tool cases. Custom mat printing is available. Includes 24 in. x 24 in. (61.0 cm x 61.0 cm) mat with two pockets, wrist strap, ground cord and instructions.

Product No.	Description
FSKL3RD	Field Service Kit Kit includes: 1 - 24 in. x 24 in. (61.0 cm x 61.0 cm) Mat with two pockets 1- Adjustable Fabric Wrist Band 1- 6 ft. Coiled Cord 1- Common Ground Cord, 15 ft. (4.6 m) with clip instructions

Properties

Product	Typical Value
Mat	3-layer, vinyl, red, 10^{7-8}
Common Ground Cord	15 ft. (4.6 m), 1 meg resistor, bulldog clip
Coiled Cord	6 ft. (1.8 m), 1 meg resistor
Wrist Band	Fabric, adjustable

Workstation Products

3M™ Signs

Protect your products by notifying staff and visitors that static control precautions are required. Signs and Aisle Marking Tape allow you to clearly identify the areas requiring static protective measures. Apply them to doors, floors, walls, tote boxes, or to any area containing static sensitive parts. As part of ISO9000, many companies have implemented ESD control programs that reference the standards ESD 20.20, EIA 625, or MIL-HDBK-263. These standards require that work areas for static sensitive items be designated.

3M™ ESD Warning Signs

3M™ ESD Warning Sign,
4 in. x 10 in. (10.2 cm x 25.4 cm)

3M™ ESD Warning Sign,
8.5 in. x 11 in. (21.6 cm x 27.9 cm)

These signs provide the warning message and symbol as required by EIA 625 and MIL-HDBK-263. Black lettering on a yellow background gives clear warning that static-safety precautions are necessary. Signs come complete with adhesive strips for easy mounting.

Product No.	Description
ESDSIGN4X10	4 in. x 10 in. (10.2 cm x 25.4 cm) Sign
ESDSIGN8.5X11	8.5 in. x 11 in. (21.6 cm x 27.9 cm) Sign

3M™ ESD Warning Posters

3M™ ESD Warning Poster,
17 in. x 22 in., English (43.2 cm x 55.9 cm)

3M™ ESD Warning Poster,
17 in. x 22 in., Spanish (43.2 cm x 55.9 cm)

These poster-sized 17 in. x 22 in. (43.2 cm x 55.9 cm) signs are great for building and section entry areas. Available in English or Spanish. Packaged five posters per box.

Product No.	Description
SIGN17X22E	17 in. x 22 in. (43.2 cm x 55.9 cm) Sign, English
SIGN17X22S	17 in. x 22 in. (43.2 cm x 55.9 cm) Sign, Spanish

3M™ Aisle Marking Tape

3M™ Aisle Marking Tape, 3 in. x 54 ft. (7.6 cm x 16.5 m)

Protect your products by notifying staff and visitors that static control precautions are needed. ESD Aisle Marking Tape allows you to clearly identify the areas requiring static protective measures. This 6 mil, scuff-resistant tape features a repeating ESD Warning Symbol and message. Bright yellow background makes the black text easy to read. Rolls are 3 in. (7.6 cm) wide and 54 ft. (16.5 m) long on a 3 in. (7.6 cm) core.

Product No.	Description
AISLETAPE54	3 in. x 54 ft. (7.6 cm x 16.5 m) Caution Tape

3M™ Electronics Vacuum, Model 497AJM

3M™ Electronics Vacuum, Model 497AJM

Features

- Detachable power cord for easy storage.
- Easy change out of motor, making the vacuum easy to service.
- Lightweight (less than nine pounds) and easy to setup.
- Complete attachment offering including: stretch hose, crevice tool, wand and brush.
- Dimensions: 7.8 in. x 17.8 in. x 9.3 in. (19.8 cm x 45.2 cm x 23.6 cm).

The Electronics Vacuum is a self-contained unit that is designed for high-efficiency cleanup of most business equipment, including removing toner and dust. Portability, quick setup and efficient safe operation are key features of this vacuum. A 220V international version is available, model number 497ABF.

Product No.	Description
497AJM	Designed for high efficiency cleanup of most business equipment, including removing toner and dust.

3M™ Electronics Vacuum, Model 497AJW

3M™ Forensics Vacuum, Model 497AJW

Features

- Portable vacuum.
- Single use, disposable filter.
- Retains extremely small particles.

The Forensics Vacuum is an extremely powerful unit designed for high-efficiency collection of particulate evidence that meets most law enforcement needs.

To ensure that collected evidence remains uncontaminated, the system utilizes a specially designed, single-use, disposable filter. The filter is assembled and packaged in an evidence bag. The filter and bag are then inserted into a heat-sealed poly bag to prevent tampering.

Product No.	Description
497AJW	Forensics Vacuum

RoHS Compliant 2002/95/EC

Forensics Vacuum Accessories

Item	Typical Properties
FF1	Single-use Sealed Filter
SV-SRP	Short Red Filter Plug

3M™ Filter, Type 1

3M™ Filter, Type 1

For 3M™ Electronics and Forensics Vacuums

The Filter, Type 1 for fine particles, is the premium choice for filter media. Constructed with a concentrated weave, the Type 1 Filter is ideal for trapping fine particles to 0.3 microns. This pleated filter is encased in plastic making it durable and easily disposable. It can be used in applications in the laser printer and copier arena as well as around highly sensitive equipment.

Product No.	Description
SV-MPF1	Filter, Type 1

3M™ Filter, Type 2

3M™ Filter, Type 2

For 3M Electronic and Forensics Vacuums

The Filter, Type 2 for Toner/Dust, is used in a wide variety of applications including removing toner from laser printers and copy machines. This pleated filter is encased in plastic making it durable and easily disposable. Replacing a full filter is easy and clean.

Product No.	Description
SV-MPF2	Filter, Type 2

3M™ Electronic Vacuum Accessories

Image	Part No.	Description
	SV-MPF2	High Performance Filter, Type 2 filter for medium-sized particles. Specifically designed for collecting unwanted toner from copiers and laser printers.
	SV-MPF1	Fine Particle Filter, Type 1. This filter has a more concentrated weave for collecting extremely fine particles.
	SV-CS1	Carrying Strap Assembly
	SV-SH32	Vacuum Hose Assembly. This 32 in. (81.3 cm) hose stretches to approximately 10 feet (3.0 m)
	SV-LRP	Long Red Filter Plug. This plug is used to cover the filter inlet for storage when the vacuum cleaner is not in use.
	SV-SRP	Short Red Filter Plug. This plug is used to cover the filter inlet for disposal.
	SV-PCR3	Power Receptacle Replacement with Filter. 120v direct replacement for use with model 497AJM.
	SV-CN1	Crevice Nozzle
	SV-CB1	Crevice Brush
	SV-WA2	Curved Wand Nozzle
	SV-NN	Needle Nose Nozzle
	SV-DBSD1	Dusting Brush

Notes

3M Instrumentation Products Can Do More

ESD Event Monitors
- Measures ESD events AND static fields.
- Measures HBM, CDM, MM AND separates CDM events from other ESD events.
- Records the data received AND provides date/time ESD event happened.

Wrist Strap and Ground Monitors
- Measures operator resistance AND voltage.
- Measures impedance AND EMI voltage on metal grounds.
- Identifies AND monitors EOS (electrical overstress).

Air Ionizer Control and Monitors
- Controls AND monitors the ionization inside an automated tool or on a benchtop.
- Provides data on ion balance AND measures ionization decay.
- Sends information to facility monitoring system AND collects data for customer.

3M™ EM Aware TNG ESD Event Monitor

3M™ EM Aware TNG ESD Event Monitor

As an ESD management tool, the EM Aware TNG ESD Event Monitor will:
- Assess the existing ESD environment by collecting factual data and providing information to make an informed decision on the level of ESD protection needed.
- Verify in real time how effective these ESD protective measures are.
- Provide continual information on the actual ESD environment to help ensure that ESD problems don't go unchecked.
- Be a comprehensive diagnostics and troubleshooting tool for ESD and EMI problems.

The improved design features a metal case module with a built-in LCD display, a joystick control feature, CDM mode to reject non-ESD/EMI events, power supply, communication interface to a PC and data logging software. Several EM Aware monitors can be connected to a PC for a comprehensive analysis of your manufacturing process.

Features
- ESD events: magnitude and count.
- Static voltage.
- Ionization balance.
- Ionizer decay.
- EMI.
- CDM mode.
- LCD user interface.
- Broad sensitivity range.
- Adjustable sensitivity.
- Audio and visual indication.
- Stand-alone or networked.
- Output to FMS and DAQ.
- Individual alarm settings.
- Local or remote antenna.
- Joystick control.

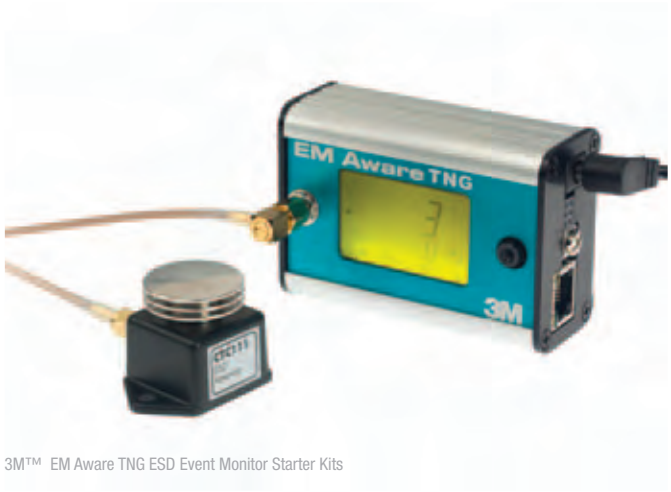
Properties	Typical Value
ESD Event Threshold Range	60 – 140 dBuV (default setting: 80 dBuV)
R Load	250 Ohm
Static Voltage Range	12.5, 100, 250, 500, 1000 Volts
Signals	Uout = 1 V (4 mA for 250 Ohm) for high negative static voltage value range Uout = 5 V (20 mA for 250 Ohm) for high positive static voltage value range
Ionization Balance Range	+/- 5 Volts max
Charge Decay Limit	2 Volts max (16 seconds)
R Load	250 Ohm
Decay	00.0, U = 1 V 16.0, U = 2 V The dependence is linear Decay which is >16.0 does not show on display
Alarm Indicators	Buzzer (with disable switch)
Operating Environmental Range	Temperature: 41ºF, (5ºC) to 104ºF (40ºC) Humidity: 80% R.H. Maximum for temperatures up to 88ºF (31ºC), decreasing linearly to 50% relative humidity at 104ºF (40ºC)
Dimensions	3.15 in. W x 1.60 in. H x 2.20 L in. (80 mm x 40 mm x 56 mm) antenna not included
Ground cable	20AWG, multi-strand, OD: 2.5mm, black, #6 ring terminal.
Inputs	SMA Connector for Remote antenna
Outputs	RJ45 connector, 4 — 20mA analog output (PC is not included)
Color	Silver, Teal Green
Display	LCD segment
Power Supply	Adapter, 12 Vdc , center positive, 0.3A

EM Aware TNG ESD Event Monitor Selection Guide

Model	ESD Events	Event Magnitude	Event Counter	Static Voltage	Ionizer Balance	Ionizer Decay
3M034-031-TNG	√	√	√	√	√	√
3M034-030-TNG	√	√	√	√	√	
3M034-3-TNG	√	√	√			

Related Products

EM Eye Meter . . . . . pg. 61
ESD Pro ESD Event Indicator . . . . . pg. 63



3M™ EM Aware TNG ESD Event Monitor Starter Kits

3M™ EM Aware TNG ESD Event Monitor Starter Kits

The easiest way to get started with EM Aware TNG Monitor is to use one of the Starter Kits, which contains everything needed to connect several EM Aware TNG Monitors to your computer to start collecting data on your ESD/EMI environment. EM Aware TNG Starter Kits are ideal for diagnostics and portable or small installations. Each starter kit includes a number of selected EM Aware TNG Monitors, remote antennae, USA data acquisition system, Windows™-based software, worldwide power adapter, and necessary cables and interconnects.

EM Aware TNG ESD Event Monitor Starter Kit Selection Guide

Model	ESD Events	Static Voltage	Ionization Balance	Ionization Decay
3M3A5-C-TNG	√	√	√	√
3M2A6-C-TNG	√	√	√	
3M1A4-C-TNG	√			

The number of monitors per kit can vary depending on selected features.

Product No.	Description
3M2A6-C-TNG 3M2AM6-C-TNG	An excellent value and most popular for troubleshooting and diagnostics. This kit offers EM Aware's proprietary ESD event monitoring, as well as static voltage monitoring and ionization balance. Recommended for tool and workstation monitoring/diagnostics, in and out of cleanroom. Applications where the monitoring of electrostatic discharge (ESD) events and static-field voltage are key. Both kits include: • 6 EM Aware monitors equipped with the option to monitor both static voltage and ESD events • 6 remote antennae CTC111 with RF cables • Data acquisition system with software for MS Windows™ • Data acquisition system in 3M2AM6-C-TNG kit comes with memory card and reader • Worldwide power supply • All necessary cables and interconnects
3M3A5-C-TNG 3M3AM5-C-TNG	This full-featured kit provides the broadest range of monitoring capabilities including electrostatic discharge (ESD) events, static voltage, ionization balance and ionization decay. Recommended for those applications, inside or outside the cleanroom, where ionization, balance and decay are included critical parameters. Both kits include: • 5 EM Aware monitors equipped with the option to monitor ionization parameters, ESD events and electrostatic voltage • 5 remote antennae CTC111 with RF cables • Data acquisition system with software for MS Windows™ • Data acquisition in 3M3AM5-C-TNG kit comes with memory card and reader • Worldwide power supply • All necessary cables and interconnects
3M1A4-C-TNG 3M1AM4-C-TNG	This kit allows you to identify, measure and manage the most critical parameters that typically signify harmful ESD events in manufacturing environments, inside and outside the cleanroom. Recommended for tool and workstation monitoring where electrostatic discharge (ESD) events are a major concern. Both kits include: • 4 EM Aware monitors • 4 remote antennae CTC114 with RF cables • Data acquisition system with software for MS Windows™ • Data acquisition in 3M1AM4-C-TNG comes with memory card and reader • Worldwide power supply • All necessary cables and interconnects

3M™ EM Eye Meter

3M™ EM Eye Meter

ESD Event, Electromagnetic Field and RF Signal Measurements

The EM Eye Meter is one of the smallest and most versatile instruments for measuring ESD events, EM fields and RF signals. Weighing just 9 ¾ ounces, the EM Eye Meter can literally fit in the palm of your hand or in your shirt pocket. The touch screen and color display make this instrument very easy to use.

The EM Eye Meter is shipped with the following items:

- Base EM Eye Meter module.
- One or more of the following sensor heads:
  - ESD event sensor with antenna.
  - Electromagnetic field sensor with antenna.
  - RF signal sensor (includes RF cable and 20 dB attenuator).
- Power supply adapter.
- Lithium ion battery, lithium coin battery.
- Optional accessories may be ordered separately:
  - Remote antenna CTC113.
  - Remote antenna CTC115 (extended temperature).

Product No.	Description
CTM048-2128	EM Eye Meter with ESD and EMI Sensors
CTM048-2829	EM Eye Meter with EMI and RF Sensors
CTM048-2122	EM Eye Meter with ESD Sensor and 20KV ESD Sensor
CTM048-212829	EM Eye Meter with ESD, EMI and RF Sensors
CTM048-21	EM Eye Meter with ESD Sensor
CTM048-22	EM Eye Meter with 20KV ESD Sensor
CTM048-28	EM Eye Meter with EMI Sensor
CTM048-29	EM Eye Meter with RF Sensor
If you're already using the EM Eye Meter and would like to add another sensor, you can order:	
CTC021	ESD Sensor
CTC022	ESD Sensor, 20KV
CTC028	EMI Sensor
CTC029	RF Sensor

Related Products

EM Aware TNG ESD Event Monitor . . . . . pg. 59
ESD Pro ESD Event Indicator . . . . . pg. 63

3M™ EM Eye Meter Modes

ESD Events Detection

Features

- Detects ESD events and locates their sources.
- Measures the magnitude of individual ESD events.
- Counts ESD events.
- Logs ESD events with their magnitude and time/date stamp for generating ESD environment diagrams and records.
- Listen to ESD event "crackles" via internal speaker or optional headphones.

The EM Eye Meter is capable of detecting ESD events and characterizing them in HBM, CDM or MM models. It is capable of rejecting non-ESD related events, making analysis easier. The meter is easy to operate and can be used by almost anyone who is involved with ESD. It provides information on estimated discharge voltages at a specific location, what time it occurred, and how many discharges have occurred. The meter's small size (2.6 W x 1.3 D x 4.1 L in. [6.5 W x 3.2 D x 10.5 cm L]) allows it to be used in tight locations inside the tools or in a wider area of interest. For extended temperature environments, the EM Eye Meter uses an optional remote antenna which will work under most conditions. All information is recorded on an SD™ card for easy review and retrieval of data.

Applications for ESD events detection include: ESD audits and surveys; ESD diagnostics; reduction of yield losses caused by ESD; data logging for ESD reports and statistical analysis.

RF Signal Sensor

Features

- Broad frequency range (1 MHz to 2.5 GHz).
- Wide dynamic range.

The EM Eye Meter, with the replacement RF sensor head, is capable of measuring RF signals. Usually used by radio communications designers and engineers, the EM Eye Meter will be able to provide a readout of RF signal voltages. The EM Eye Meter offers excellent sensitivity and linearity.

Applications for using the RF Signal Sensor include: product design; research and development; service, repair and maintenance of RF equipment.

Electromagnetic Field (EMF) Measurement

Features

- Measures electromagnetic field strength over a wide dynamic range.
- Measures both continuous and pulsed fields.
- Measures field strength and power density.
- Measures EIRP of a transmitter.
- Locates sources of EMI.

By simply placing the EMF sensor head into the EM Eye Meter base, the EM Eye Meter transforms into a dedicated EMF meter, a power density meter and an EIRP meter. The EM Eye Meter detects and measures high frequency electric fields that may be present in equipment, tools, circuit boards or on any process in a manufacturing area. The EM Eye Meter also measures high frequency electric fields from mobile phones, over-the-air TV signals, wireless LANs and any other source generating fields within its specification. The EM Eye Meter comes with a miniature directional antenna that measures just one parameter. The meter then can calculate several parameters from that original one. The directional antenna reduces the influence of ambient electromagnetic fields when measuring emission coming from the specific source. So whether you're in the fields of product design, mobile phones, TV signals or wireless LAN, the portable EM Eye Meter is a helpful and important part of your toolbox. Applications for measuring electromagnetic fields include: EMC diagnostics; antenna installation and maintenance; telecommunications; RF safety; diagnostics of power equipment; interference analysis; site survey.

3M™ ESD Pro ESD Event Indicator

ESD or EMI?

Often, devices such as relays, solenoids, stepper motors, and others generate signals similar to those of ESD events. In order to separate genuine ESD events from those caused by equipment operation, the ESD Pro Indicator uses proprietary signal processing to differentiate signal waveforms with the focus on CDM-type events that are most critical in electronics manufacturing.

The ESD Pro Indicator comes with an antenna; 9V battery; storage case; and user's guide.

3M™ Ground Pro Ground Integrity Meter

Areas Not Touched by Multimeters

A typical multimeter measures resistance by applying DC voltage to the circuit and measuring voltage drop. Any current in the ground connection, which is a common occurrence in a working tool, can easily be factored in the calculations and cause a multimeter to produce an unrealistic result such as negative or extremely high resistance. Ground Pro uses proprietary DSP technology to measure ground impedance while completely ignoring noise and currents on the ground, providing reliable readings in difficult environments.

Related Products

Ground Man and Ground Man Plus Ground Monitors . . . . . pg. 81
Ground Master Equipment Ground Monitors . . . . . pg. 80
Wrist Strap and Ground Monitor 773 . . . . . pg. 82

3M™ ESD Pro ESD Event Indicator

The ESD Pro ESD Event Indicator is a hand-held indicator of ESD events that shows the relative strength of each ESD event and counts the number of ESD events above the set threshold. ESD events, or electrostatic discharges, can damage sensitive electronic components. The ultimate goal of ESD protection such as grounding, wrist straps, ionizers and static dissipative mats is to prevent ESD events, or at least decrease their strength and frequency of occurrence. The only way to verify that your ESD protection works is by knowing whether you have ESD events in your environment, how strong they are and how many of them occur. Thus, ESD Pro serves as your ultimate measure of effectiveness of your ESD protection.

The ESD Pro Indicator is capable of rejecting most non-ESD related EMI (electromagnetic interference) events. This methodology allows assessment of the ESD environment in places where EMI events resulting from stepper motors, solenoids, relays, etc. occur.

Product No.	Description	
CTM082	Hand-held ESD event indicator with event count, adjustable threshold and relative event strength indicator	
	Size, in. 6.25 H x 3.75 W x 1.25 L	(cm) (15.9 x 9.5 x 3.2)

Related Products

EM Aware TNG ESD Event Monitor . . . . . pg. 59
EM Eye Meter . . . . . pg. 61

3M™ Ground Pro Ground Integrity Meter

The 3M Ground Pro Ground Integrity Meter is an essential tool for anyone concerned with obtaining proper grounding of equipment. This dedicated meter has multiple features to verify critical grounding parameters in any facility. It measures ground impedance in accordance with ANSI/ESD S6.1 and ANSI/ESDA S20.20 standards. Because data integrity is essential, this monitor provides accurate measurements of ground impedance even when ground noise is present — an area in which many instruments fail.

It also measures AC and DC voltage on the ground while separately measuring high-frequency voltage (EMI), to aid in performing diagnostics of equipment malfunctions and lockups.

Features

- ANSI/ESDA S20.20 and ANSI/ESD S6.1 compliant.
- Accurate readings in noisy environments.
- Built-in alarm alerts personnel of potentially dangerous voltage.
- Measures high-frequency noise (EMI) on grounds in a broad frequency range.

Product No.	Description
CTM051	Ground Pro Ground Integrity Meter

3M™ Charge Analyzer/Charge Plate Monitor

3M™ Charge Analyzer 711

The 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, 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. All parameter settings are controlled via a built-in EEPROM. Periodic calibrations can be performed without the need to open the chassis. When the Charge 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 analyzer 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 • PTFE Measuring Lead, 1 m • Grounding Cord with Alligator Clip • RS 232 Interface Cable • 2 in. (5.1 cm) High Conductive Container with Insulating Handle • Insulated Bulldog Clip • Metal Spacers (3) with Thread, 3 in. length (7.6 cm) • Software Disk for Data Acquisition • Operating Instructions • Transport Case • Certificate of Conformity • Sensor, 711 RS for Measuring Electrostatic Fields, with 6.5 ft. (2.0 m) Cord

RoHS Compliant 2002/95/EC

3M™ Charge Analyzer 711 Properties

Item	Typical Properties
Dimensions	Base unit: 6 H x 6 W x 6 L in. (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: 10M ohm)
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} ohm (PTFE-separators cleaned)
Accuracy	± 2.5% of range end value (digitized); ± 5% for the analog output (for 1000 V range); ± 10% for the analog output (25, 100, 500 and 5000 V 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 and 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, 6 in. x 6 in. (15.2 cm x 15.2 cm), 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)

*Charge Plate Monitor

3M™ Static Sensor 718

3M™ Air Ionizer Tester/Field Meter and Charger

Static Sensor

The Static Sensor 718 is an easy-to-use, hand-held instrument designed to measure static fields 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 Physical Characteristics

Item	Typical Properties
Dimensions	0.85 H x 2.4 W x 4.15 L in. (2.2 x 6.1 x 10.5 cm)
Weight	4.5 oz. (127.6 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	3 1/2 digit liquid crystal display
Distance Indicator	LED targets. Aligned targets indicate 1 in. (2.5 cm) measurement distance.
Measurement Accuracy	Within 5% of actual voltage
Certifications	UL, C-UL, CE, CB-scheme, NOM

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.

NOM CE c UL us LISTED 20 IECEE CB SCHEME

3M™ Air Ionizer Test Kit 718A

3M™ Air Ionizer Test Kit

The 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 Physical Characteristics

Item	Typical Properties
Charge Plate Assembly	Per ESD Association Standard Practice - 3.3
Charge Plate Assembly Weight	2.5 oz (70.9 g)
Charger Dimensions	0.85 H x 2.4 W x 5.0 L in. (2.2 x 6.1 x 12.7 cm)
Charger Weight	6 oz. (170.1 g) with battery
Charger Power Requirements	One 9 V alkaline battery
Charger Output	1100 V minimum for positive or negative voltage
Certifications	UL, C-UL, CE, CB-scheme, NOM

3M™ Test Kits for Static Control Surfaces

3M™ Test Kit 701

The 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 (10 V and 100 V), and system continuity. The easy-to-read scales are both color-coded and numbered.

Product No.	Description
701	Test Kit for Static Control Surfaces (Certified and non-certified) Kit contains: • 1 Megohmmeter 12 oz. (340 g) 1.8 H x 3.3 W x 4.6 L in. (4.6 x 8.4 x 11.7 cm) • 2 Test Weights, 5 lbs. (2.27 kg) each • 2 Test Leads, 10 ft. (3.0 m) each • 1 Insulated Bulldog Clip • 1 Alligator Clip • 1 Continuity Test Plate • 2 Batteries (22.5 V and 1.5 V) • 1 Operator's Manual • 1 Molded Carrying Case
701-L	Test Leads
701-M	Megohmmeter only
701-W	5 lb. (2.27 kg) Test Weight

RoHS Compliant 2002/95/EC

Test Kit Properties

Product	Item	Typical Properties
Kit	Weight:	14 lb. (6.35 kg)
	Case Dimensions:	5.125 H x 10 W x 13.5 L in. (13.0 x 25.4 x 34.3 cm)
	Case Material:	Blow-molded, high density polyethylene with foam inserts
	Case Color:	Gray
Meter	Weight:	12 oz. (0.34 kg)
	Dimensions:	1.8 H x 3.3 W x 4.6 L in. (4.6 x 8.4 x 11.7 cm)
	Resistance Ranges: Continuity Test Mode 10 V Surface Test Mode 100 V Surface Test Mode	 0 – 10M ohm (internal R=500 K ohm) 10^5 – 10^{11} ohm (internal R=2 M ohm) 10^5 – 10^{11} ohm (internal R=2 M ohm)
Weights	2 Test Weights:	5 lb. (2.27 kg) each
	Dimensions:	Diameter – 2.5 in. (6.4 cm) Height – 5.06 in. (12.9 cm); includes handle and pad
	Pad Material:	Conductive silicon rubber
	Pad Dimensions:	Diameter – 2.5 in. (6.4 cm) Thickness – 0.25 in. (0.6 cm)
Leads	Length:	10 ft. (3.1 m)
	Wire Size:	18 gauge
	Insulation:	Silicon rubber
	Diameter:	0.125 in. (0.3 cm)
Power Supply	Batteries (2):	22.5 volt (Eveready™ #505 or equivalent) and 1.5 volt (AA)

Related Products

Floor Mats/Rolls . . . . . pg. 40
Dissipative Rubber Mats/Rolls. . . . . pg. 41
Static Conductive Floor Tile. . . . . pg. 90

3M™ Surface Resistance/Resistivity RTG Meter SCC-625

Product No.	Description
SRMETER	Surface Resistance/Resistivity RTG Meter

3M™ Surface Resistance Meter SCC-625

The Surface Resistance Meter SCC-625 is a wide-range, multi-scale, auto-ranging meter. It measures resistivity per ASTM D257, and Resistance to Ground (RTG). Appropriate for auditing static control items. Measures conductive, dissipative and insulative items. The meter is battery powered and simple to use. High-speed electronics provide repeatable measurements.

Properties

Electrical	
Measurement	10^3 to 10^{12} ohm/square ASTM D257 10^2 to 10^{11} ohm EOS/ESD 11.11
Resolution	one order of magnitude
Accuracy	± 1/2 decade
Power	9 volt battery
Electrodes	Parallel Bar
Mechanical	
Weight	6.2 oz (176.0 g)
Size	4.5 H x 2.7 W x 1.0 L in. (11.4 H x 6.9 W x 2.5 L cm)

3M™ Data Logging Software 747DLS

Data Logging Software 747DLS, included with the 3M™ Shoes/Wrist Strap Tester 747, offers you a complete system for 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.

Features

- Electronic data logging virtually eliminates manual logging, providing highly reliable records.
- Can be used with barcode, magnetic stripe or proximity card readers/identification cards.
- 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.

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)

3M™ Shoes/Wrist Strap Tester 747

Wrist Strap Tester 747 Properties

Item	Typical Properties
Dimensions	7.7 in. x 4.7 in. x 1.89 in. (H x W x D) (19.6 cm x 11.9 cm x 4.8 cm)
Weight	1.2 lb. (0.54 kg) 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

Product No.	Description
747	Shoes/Wrist Strap Tester (certified only)
747DLS	Data Logging Software

3M™ Shoes/Wrist Strap Tester 747

Daily inspection and recording of wrist straps and shoes testing are very important as fundamental countermeasures against static on personnel. A fully functional resistance tester, the 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, virtually eliminating manual recording and possible errors.

Features

- Checks personnel wearing wrist straps, ESD shoes and heel straps against preset resistance limits.
- Actual measurements are indicated on a 3.5 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.
- The Shoes/Wrist Strap Tester comes with an AC adapter; ESD shoe testing cord; wall-mounting board; data logging software CD with operating instructions; ESD shoe testing plate and mounting screw; LR6 alkaline battery; null modem cable; and quick guide test card.

The 747 is shipped with:

- AC adapter.
- ESD shoe testing cord.
- Wall-mounting board.
- ESD shoe testing plate.
- Mounting screw for ESD shoe testing plate (with washer).
- 6 LR6 alkaline batteries.
- Null modem cable, 5.91 ft (1.8 m).
- Quick guide test card.

ESD Shoe and Heel Strap Testing

- Electrical resistance of ESD shoes and heel straps are measured and compared to preset limits.
- Set value for the upper and lower resistance limits can be varied. Upper limit: 10 megohm, 35 megohm, or 100 megohm.
  Lower limit: 100K ohm, 1.0 megohm.
- LCD display (3.5 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.
  (5 megohm, 10 megohm and 35 megohm).
  Lower resistance limit 650K ohm preset internally.
- LCD display (3.5 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.

3M™ Wrist Strap and Footwear Tester

The 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.

Product No.	Description
740	Wrist Strap and Footwear Tester
741	Shoe Electrode

Wrist Strap and Footwear Tester 740 Properties

Item	Typical Properties
Dimensions	5.43 H x 7.48 W x 2.09 in. D (13.8 x 19.0 x 5.3 cm)
Weight	15.75 oz. (450 gm)
Power Supply	27 Vdc transformer, 150 mA (AC/DC adapter supplied) 6 ft. (1.8 m) wire
Test Voltage	20 Vdc, ± 1 volt (open circuit)
Resistance Ranges	Lower limit: 750K ohm
Upper Limit Wrist Strap	2, 5, 10 and 35M ohm
Upper Limit Footwear	10, 35, 50 and 100M ohm
Accuracy	+ 20%, -0% for 750K ohm lower limit ± 10% for 2M, 5M, 10M, 35M and 50M ohm ± 20% for 100M ohm
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

Item	Typical Properties
Dimensions	20 H x 16 in. W (50.8 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.

3M™ Combination Tester

3M™ Combination Wrist Strap and Footwear Tester

This basic Combination Wrist Strap and Footwear Tester allows associates to test their own wrist straps, heel grounders or shoes. Results are immediate and easy to understand. A red light indicates high resistance and a yellow light indicates a resistance that is too low. A green "Pass" light and tone indicator indicate a resistance in the acceptable range. Acceptable range is 750k to 100 megohm for footwear. Battery or AC powered. Some assembly required.

Product No.	Description
COMBOTESTER	Combination wrist strap and footwear tester

Related Products

Heel Grounders . . . . . pg. 33
Wrist Straps . . . . . pg. 26

3M™ Wrist Strap Tester 746

Product No.	Description
746	Wrist Strap Tester supplied with an AC adapter, an alkaline battery, and a wall mounting kit, also available as a certified unit. Size, in. (cm) 6.25 H x 3.75 W x 1.25 L (15.8 x 9.5 x 3.2)

3M™ Wrist Strap Tester

The 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 9V alkaline 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 Properties

Item	Typical Properties
Weight	7 oz. (200 g) without battery
Power	9 V alkaline (supplied with 746)
Battery	9 V alkaline (NEDA 1604LC) (supplied with 746) Does not contain mercury, cadmium or lead.
Test Voltage	19 V DC, ± 1 V (open circuit)
Resistance Ranges	Upper limit – 10 M ohm ± 10% Lower limit – 750 K ohm +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 — 0.2 (0.D) x 0.1 (I.D) x 0.4 in (L) [5.1 (O.D.) x 2.6 (I.D.) x 10.2 mm (L)] **Output Connector** Polarity — Center negative

3M™ Pedestal Stand 749

3M™ Pedestal Stand 749

The Pedestal Stand supports 3M™ Wrist Strap Testers 740, 747 and 746 and can accommodate certain models of barcode and magnetic readers. Designed for use in manufacturing areas, this unit is self-supporting, stand alone and portable.

The Pedestal Stand comes with a stand pole; base; hardware; ground wire; and instructions.

Product No.	Description
749	Pedestal Stand for Wrist Strap Testers

RoHS Compliant 2002/95/EC

Notes

3M™ WS Aware Dual Workstation Monitor CTC061 (Stand not included)

WS Aware

Parameters Monitored	Typical Properties
CTA242	This remote terminal connects to WS Aware workstation monitors and provides connection for dual wire wrist straps for an operator and a visitor. Proprietary plug-in replaceable board with the jacks reduces cost of ownership of the monitor since only one inexpensive board needs to be replaced when the jacks are worn out, instead of the entire terminal.
CTA243	Before sensitive devices are handled, Big Brother alarms alert the operator to plug-in. Once Big Brother senses that the operator is properly grounded the alarm is silenced. The Big Brother wrist strap terminal makes the WS Aware one of the most intelligent and cost-effective systems on the market today.
CTC061 Metal Ground (Tools) Dissipative Surfaces	 2 connections 2 connections
CTC062 Metal Ground (Tools)	 4 connections
Monitored Ground Connector	No-screw terminal
Connection Activation Metal Ground Alarm	Dip-switch (no jumpers) 1 – 20 ohm (10 ohm default)
Dissipative Ground Alarm	10 – 1,000 megohm (1,000 megohm default)
Imposed Voltage Metal Ground Dissipative Surfaces	 < 0.075 V open circuit < 0.4 V open circuit
EMI on Metal Ground Sensitivity	 0 dBm (226 mV) default
Local Indication	Good/alarm/off, LED, buzzer
Indicated Parameters	Resistance to ground EMI on metal ground
Output Parameters	Availability (pass/fail)
Output Parameters for Each Connection	Resistance to ground EMI (metal ground) (MODBUS)

Connectivity

Item	Typical Properties
Interface	
Current Loop	4 – 20 mA
Logic Level	0/20 mA
MODBUS	MODBUS std. compliant
Data Connector	RJ45 jack

Please contact 3M for special quotation to support FMS.

3M™ WS Aware Dual Workstation Monitor

Features

- Highly integrated credit card-size unit offers combination of features.
- Proper operator grounding – Big Brother operator presence detector alerts if an operator is within reach of sensitive components but is not plugged in.
- Ultra-low voltage – only 25 millivolts of signal to any part of wrist strap at any time.
- ANSI ESD S6.1 and ANSI ESDA S20.20 compliant.
- EMI monitoring on grounds.
- Output to facility monitoring system.
- Replacement board with jack, CTA245.
- The WS Aware Monitor comes with two remote terminals; two 10 ft. (3.0 m) cables; grounding hardware; and a user's guide.

The WS Aware Workstation Monitor provides continuous monitoring of all grounding parameters on a workbench or in a tool in full compliance with ANSI 6.1 and ANSI/ESDA S20.20 requirements, as well as high-frequency noise (EMI) on ground. For operators, WS Aware Monitors utilize dual wrist straps for a continuous resistivity check of human body connection using advanced DSP technology for reliable monitoring utilizing ultra-low control voltage. Each operator's body voltage is also continuously monitored. Optional Big Brother terminals allow the monitor to alarm when an operator approaches static-sensitive components, but does not plug in his or her wrist strap properly.

WS Aware CTC061 provides continuous monitoring for two metal grounds (such as tools) and for two "soft" grounds (such as dissipative mats, surfaces and parts made of dissipative plastics), or four metal grounds (CTC062). It provides monitoring of EMI on metal grounds with programmable alarm thresholds. As electromagnetic interference (EMI) is rapidly becoming a significant factor in equipment failures, this proprietary feature helps to provide proper operation of your equipment.

General

Item	Typical Properties
Power (local or network) Voltage	12..24 VDC
Current Consumption	<150 mA
Dimension (approx.)	1.30 H x 2.25 W x 3.2 L in. (3.3 x 5.7 x 8.1 cm)
Weight (approx.)	4.25 oz (120.5 g)

Wrist Strap Monitor

Item	Typical Properties
Wrist Strap Type	Dual, 0.1 in. (3.5 mm) plug
Wrist Straps Monitored	2
Imposed Voltage on Body	0.025 V (25 mV) max.
Remote Terminals	2, one for each operator
Remote Terminal Cables	Mini-DIN 6-pin
Visitor Jack on Remote	Available
Body Resistance Alarm Level	10 megohm default
Body Voltage Alarm Level	±2.5 V default (adjustable)
Local Indication	LED, buzzer
Indicated Parameters	Availability-Continuity-Body Voltage
Output Parameters for Each Operator	Availability-Continuity-Body Voltage

Related Products

Dissipative Rubber Mats . . . . . pg. 41
Dissipative Vinyl Mats . . . . . pg. 42
Dual Conductor Wrist Straps and Cords. . . . . pg. 31
Workstation Monitor . . . . . pg. 75

3M™ Iron Man Workstation Monitor CTC330

3M™ Iron Man Plus Workstation Monitor CTC331

3M™ Iron Man Workstation Monitor

Features

- Electric overstress monitoring of every board.
- Alarms allow operators to immediately respond to electric overstress.
- Complete workbench coverage.
- The Iron Man and Iron Man Plus Monitors come with a monitor lead with alligator clip; ground connection hardware (Iron Man only); power adapter; and user's guide.

Iron Man Workstation Monitors measure voltage directly on circuit boards during assembly. If there is any electrical overstress (EOS) on a board, the operator is alerted with both visual and audio alarms. The monitors are small enough to fit on every workbench where assembly or service occurs.

Simply connect the overvoltage input to any ground plane connection of the board or to a mat on which the board is placed, with the supplied alligator connector. When there is a dangerous EOS exposure, the operator will be instantly alerted. Additionally, the board itself will be reliably grounded via a 1 megohm resistor inside the monitor.

The Iron Man Plus Workstation Monitor CTC331 adds complete monitoring of the entire workbench, including wrist strap and dissipative mat monitoring. The operator is monitored for proper connectivity and for excessive body voltage. The dissipative or conductive mat is monitored for its proper connectivity. A unique replacement wrist strap jack does not require soldering, which helps improve reliability and helps reduce the cost of ownership.

Product No.	Description
CTC330	3M Iron Man Workstation Monitor
CTC331	3M Iron Man Plus Workstation Monitor

CTC330 and CTC331 Monitor Properties

Item	Iron Man CTC330 Typical Properties	Iron Man Plus CTC331 Typical Properties
Alarm Threshold Ranges	0 – ±5 V; 0 – ±50 V	0 – ±5 V; 0 – ±50 V
Threshold Adjustment	Potentiometer	Potentiometer
Threshold Range	Range selected by jumper	Range selected by jumper
Wrist Strap		Dual, 3.5 mm plug
Operator's Resistance Alarm		Yes
Operator Body Voltage Alarm		Yes
Resistance to Ground		Yes
Visual	LED	LED
Audio	Buzzer	Buzzer
Dimensions	0.85 H x 2.4 W x 1.63 L in. (2.6 x 6.1 x 4.14 cm)	0.85 H x 2.4 W x 2.56 L in. (2.6 x 6.1 x 6.5 cm)
Power	External adapter included	External adapter included

Related Products

Dual Conductor Wrist Straps and Cords. . . . . pg. 31
Workstation Monitor . . . . . pg. 75

How to Manage Electrical Overstress (EOS)

Electrical overstress, or EOS, occurs when excessive electrical signals are applied to components and circuits. Electrostatic discharge (ESD) is only a partial case of electrical overstress and is generally considered as a separate phenomenon. While an ESD event lasts a few nanoseconds, EOS lasts much longer – it is not limited to any duration – and can inflict significant damage, often more severe than ESD.

In the static control field, the following sources of EOS may be considered the most common:

- Overvoltage from soldering irons
- Overvoltage from power tools such as electric screwdrivers, etc.
- Overvoltage from the difference in voltage between grounds (when a circuit is electrically connected to one ground while a tool – manual or automatic – is connected to another ground)
- Overvoltage from test fixtures that can produce undesirable voltage artifacts during commutation or test
- Spikes on power supply during the test
- Many other sources, often unpredictable

EOS is not a new phenomenon – it has existed for a long time. However, with increasing sensitivity of electronics components, EOS is gaining more attention as a significant factor in product yield and reliability.

There are several documents in the industry, however, that do indicate recommendations on potential damage levels to common electronics components. IPC Standards provide very specific recommendations. IPC-A-610 Acceptability for Electronic Assemblies and IPC Standard for Rework of Electronics Assemblies IPC-7711 state:

- From the outline:
  – Electrical overstress (EOS) is the internal result of an unwanted application of electrical energy that results in damaged components. This damage can be from many different sources, such as electrically powered process equipment or ESD occurring during handling or processing.
- From 3.11 (IPC-A-610) and 2.11 (IPC-7711):
  – With today's products in mind, we can see that EOS is a serious and will be even more critical in the future.
  – Current research indicates that voltages and spikes less than 0.5 volts are acceptable. However, an increasing number of extremely sensitive components require that soldering irons, solder extractors, test instruments and other equipment must never generate spikes greater than 0.3 volts.

3M™ Workstation Monitor

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

The Workstation Monitor 724 continuously monitors 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 megohm or 35 megohm, or the wiring connections exceed 3.7 megohm, audible and visible alarms are triggered. The unit will also warn of potentially dangerous low-resistance situations with a flashing yellow LED lamp. A switch allows the user to select either a 9 V or 16 V test voltage, and 10 megohm or 35 megohm resistance setting.

The monitor uses the light, compact dual conductor wrist strap (purchased separately; see page 31). Dual conductors provide the resistance circuit that is monitored, as well as grounding redundancy. If one conductor fails, the other will still function to prevent sensitive components from being exposed to static.

The Workstation Monitor 724 monitors a visitor to the workstation or a second operator. In addition, the loudness of the alarm is adjustable. The Workstation Monitor comes with a dual conductor remote input jack; AC adapter; ground cord; monitor/table mat cord; two-wire connector; wire management clips; and user's guide.

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

724 Monitor Properties

Item	Typical Properties
Dimensions	6.5 H x 3.125 W x 1.375 L 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 megohm Switch selectable Worksurface: 3.7 megohm
Lower Resistance	Wrist Strap: 1.5 megohm Worksurface: none
Accuracy	± 15%
Environmental Operating Conditions	
Temperature	Max. 110°F (43°C) Min. 50°F (10°C)
Humidity	Max. 75% R.H.
Accessories	Remote Splitter Kit 733 Stand-By Jack 3057

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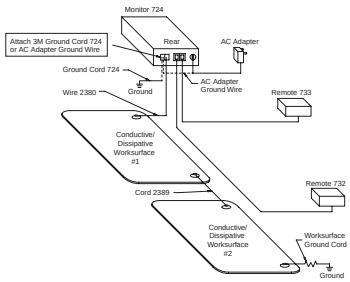
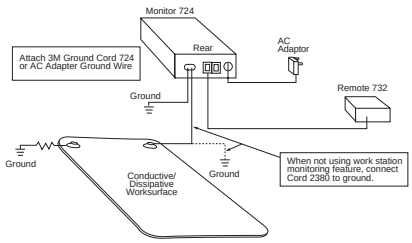




The worksurface ground resistance circuit of the 3M workstation monitor indicates a malfunction when the ground loop resistance exceeds 3.7 megohm. To determine if your mat is within this limit, perform the following procedure using an ohmmeter.

Measure the resistance between the snap on the mat, where you intend to connect the 3M™ Monitor/Table Mat Replacement Cord 2380, and the ground point for the mat. Be sure the mat is connected to ground.

3M™ Remote Input Jack 732

3M™ Remote Splitter Kit 733

3M™ 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 phone jacks — 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.

Product No.	Description
732	Replacement Remote Input Jack for the Workstation Monitor 724, 6 ft. (1.8 m) long cord **Size, in. (cm)** 3.188 H x 1 W x 1.5 in. D (8.1 x 2.5 x 3.8 cm)
733	Remote Splitter Kit, 6 ft. (1.8 m) long cord **Size, in. (cm)** 3.188 H x 1 W x 1.5 in. D (8.1 x 2.5 x 3.8 cm)

Related Products

Dissipative Rubber Mats . . . . . pg. 41
Dissipative Vinyl Mats . . . . . pg. 42
Dual Conductor Wrist Straps and Cords. . . . . pg. 31

3M™ Dual Conductor Portable Wrist Strap Monitor 725

725 Monitor Properties

Item	Typical Properties
Dimensions	2.5 H x 2.6 W x 1.1 in. D (6.4 x 6.6 x 2.8 cm)
Power Supply	9 V alkaline battery (not supplied)
Test Voltage	9 Vdc maximum
Test Current	Less than 1 microamp
Upper Resistance Limits	Wrist Strap: 35 megohm Ground Clip: 10 megohm
Lower Resistance	Wrist Strap: 1.5 megohm Worksurface: none
Accuracy	± 15%
Environmental Operating Conditions	
Temperature	Max. 110°F (43°C), Min. 50°F (10°C)
Humidity	Max. 75% R.H.
Accessories	Belt Clip 723

3M™ Belt Clip 723

3M™ 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 Wrist Strap Monitor comes with a dual conductor ground cord/clip; parking clip; and user's guide.

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 helps save money and time as a result of improved yield rates and lower field service costs.

Note: Only use 3M™ Dual Conductor Wrist Straps and Cords with the Monitor 725. See page 26 for additional information on wrist band and cord combinations.

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 2.5 H x 2.625 W x 1.125 in. D (6.4 x 6.7 x 2.9 cm)

RoHS Compliant 2002/95/EC

Related Products

Dual Connector Wrist Straps and Cords . . . . . pg. 31
Field Service Kit . . . . . pg. 53

3M™ Static Monitor 790

790 Monitor Properties

Item	Typical Properties
Monitor Size	3.5 H x 4.0 W x 1.25 in. D (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	0.2 x 0.1 x 0.3 in. (5.5 x 2.1 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	(1 V ±15%) (3 V, 6 V, & 9 V ±10%)
Ground Disconnect	10 ohm ±20%
Environmental Operating Conditions	
Temperature	Max. 104°F (40°C); Min. 50°F (10°C)
Humidity	Max. 75% relative humidity

3M™ Static Monitor 790

Features

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

The 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, allowing 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 No.	Description
790	Monitor includes: • 790 Wrist Strap Monitor • 790AC Adapter (available without AC Adapter) • 3M™ Dual Lock™ Mounting Fasteners • 2-Wire Connector

RoHS Compliant 2002/95/EC

Product No.	Description
790MP	Mounting Plate for 790 (10 per package)
790VK	Verification Kit
3057	Stand-By Jack Dual Conductor Wrist Straps and Cords (See page 31 for additional information on wrist strap and cord combinations.)

Related Products

Dual Conductor Wrist Straps and Cords. . . . . pg. 31

3M™ Monitor Verification Kit

The Verification Kits 724VK and 725VK were designed to check the wrist strap input resistance ranges of the 3M™ Workstation and 3M™ Wrist Strap Monitors 700 Series. 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). Plugs are numbered and color-coded for ease of use, allowing verification of any number of continuous monitors. See instruction manual for complete details.

3M™ Verification Kit 724VK

3M™ Verification Kit 725VK

3M™ Verification Kit 790VK

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 ft. (1.5 m) Dual Conductor Cord 2360, one test wrist band socket assembly, and one two-wire male connector with 24 in. (60.9 cm) lead wire.

724VK Kit Contents

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

790VK Kit Contents

Item
Dual Conductor Cord 2360, 5 ft. (1.5 m)
Test Wrist Band Socket Assembly
Two-Wire Male Connector with 24 in. (60.9 cm) lead wire

725VK Kit Contents

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

3M™ Workstation Monitor Checker

Features

- 3.5 mm jack for wrist strap monitor test.
- EMI button and LED for metal grounds.
- Banana jack for ground test.
- Banana jack for reference grounds.
- High (fail limit) switches for metal and soft grounds.
- Low (pass limit) switches for metal and soft grounds.
- Power switch and LED.
- Threshold setting switches.
- Body voltage set potentiometer.
- Body voltage test button.
- Pass (low limit) switch for wrist straps.
- The Workstation Monitor Checker comes with a 9V battery installed in the monitor; ground cable; ground monitor cable; male-to-male cable; and user's guide.

3M™ Workstation Monitor Checker

An easy-to-use, self-contained and portable system to verify the operation of 3M Down to Earth workstation monitors.

The Checker simulates the proper resistances and signals to check for the correct response and verify that the monitors are in compliance with your facilities specifications.

Although the Checker was designed to work with 3M monitors such as 3M™ WS Aware, Iron Man Plus, 3M™ Ground Master and 3M™ Ground Man, it may also be used to verify the operation of other monitors on the market today.

Product No.	Description
CTE701A	Workstation Monitor Checker with 3.5 mm Jack

Related Products

Ground Man and Ground Man Plus Ground Monitors for Tools . . . . . pg. 81
Ground Master Equipment Ground Monitor . . . . . pg. 80
Iron Man and Iron Man Plus Workstation Monitor . . . . . pg. 73
WS Aware Dual Workstation Monitor . . . . . pg. 72

3M™ Continuous Monitor, Single Wire, WSMONITOR1

3M™ Continuous Monitor, Single Wire, WSMONITOR2

3M™ Continuous Monitor, Single Wire, WSMONITOR3

Product No.	Description
WSMONITOR1	Monitors one wrist strap
WSMONITOR2	Monitors one wrist strap and bench
WSMONITOR3	Monitors two wrist straps and bench

Related Products

Single Wire Wrist Straps . . . . . pg. 26

Single Wire Continuous Monitor

Single Wire Continuous Monitors offer one of the most cost-effective means for continuously monitoring operator connection to ground. This system is fully automatic and activates when a wrist strap is plugged into the unit. It provides a green light for safe condition and a red light and tone for unsafe condition. Units are powered and grounded by an AC adapter. Compatible with most standard wrist straps.

The Continuous Monitors come with a remote; four screws; 120 VAC power/ground adapter; mat cord; industrial hook and loop; and user's guide.

Continuous Monitors reduce production costs by virtually eliminating the time spent testing wrist straps. Further savings may be realized by reduced ESD damage from broken wrist straps. Continuous Monitors indicate a failed wrist strap when the wrist strap breaks. A broken wrist strap that goes undetected may expose products to ESD over an entire shift.

3M™ Continuous Monitor, Single Wire, WSMONITOR1

Features

- Monitors one wrist strap/person.
- Compatible with any single-conductor wrist strap.
- Easy to use: Simply plug in the wrist strap.
- Easy to install: Attach the monitor to the bench with included hardware and plug it in.
- Size: 0.88 H x 1.75 W x 1.25 in. D (2.2 x 4.5 x 3.2 cm)

3M™ Continuous Monitor, Single Wire, WSMONITOR2

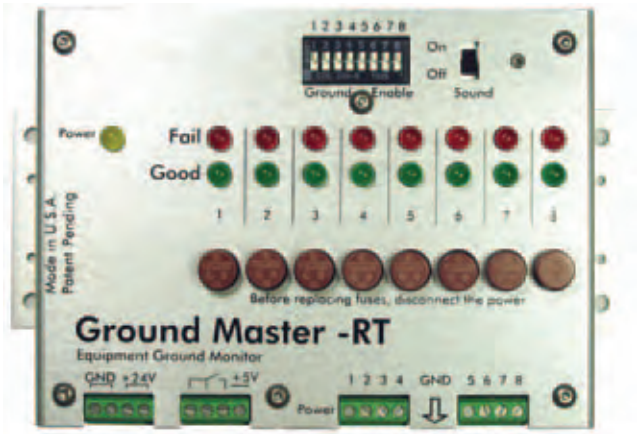
Features

- Monitors one wrist strap/person and the mat.
- Compatible with any single-conductor wrist strap.
- Easy to use: Simply plug in the wrist strap.
- Easy to install: Attach the monitor to the bench with included hardware, connect the mat and plug it in.
- Size: 1 H x 2.4 W x 2.3 in. D (2.5 x 6.1 x 5.8 cm)

3M™ Continuous Monitor, Single Wire, WSMONITOR3

Features

- Monitors two wrist straps/persons (for supervisor or second operator).
- Monitors connections to the bench mat.
- Compatible with any single-conductor wrist strap.
- Easy to use: Simply plug in the wrist strap.
- Easy to install: Attach the monitor boxes to the bench with included hardware, connect the mat and plug it in.
- Size: 1 H x 4 W x 2.4 in D (2.54 x 10.16 x 6.10 cm)



3M™ Ground Master Equipment Ground Monitor

Product No.	Description
CTC065	Ground Monitor

3M™ Ground Master Equipment Ground Monitor

Features

- ANSI/ESDA S20.20 compliant.
- Alarm threshold adjustable from 1–20 ohm.
- Each ground connection is protected by individual fuse in case of incorrect wiring.
- EMI monitored on each ground.
- Output to data acquisition or facility monitoring system (depending on model).
- Logic signal output to the tool shuts tool down if ground fails (depending on model).
- The Ground Master Monitor comes with four additional fuses; grounding hardware; universal power adapter; and user's guide.

Ground Master Equipment Ground Monitors are designed to provide continuous monitoring of proper ground connections of up to eight tools and up to 16 tools in tandem with another Ground Master monitor. The monitor shows which individual ground connection is being monitored and its status. Ground Master Monitor also monitors EMI on each ground, to assist in diagnostics of lockups and malfunctions.

Each ground connection has its own easily replaceable fuse to help prevent dangerous voltages from incorrect wiring propagating to other equipment.

The Ground Master Monitor provides intelligent information to a facility monitoring system with detailed status on each ground connection. The Ground Master RT provides relay closure and a logic signal to the tool so that it can be shut down in case of ground failure. Contact 3M for the model most suited for your applications.

Related Products

Ground Man and Ground Man Plus Ground Monitors . . . . . pg. 81
Ground Pro Ground Integrity Meter . . . . . pg. 63
Wrist Strap and Ground Monitor 773 . . . . . pg. 82

3M™ Ground Man Ground Monitor

3M™ Ground Man Plus Ground Monitor

3M™ Ground Man and Ground Man Plus Ground Monitors for Tools

Features

- ANSI/ESDA S20.20 compliant.
- Adjustable threshold alarm from 1–20 ohm.
- Logic signal out to the host tool.
- Complete tool coverage.

3M Ground Man Monitors allow users to continuously monitor up to three connection points on tools. The monitors indicate whether each individual ground connection being monitored is within specification or has failed. Ideal applications include SMT pick-and-place tools, IC handlers, wire bonders, die attach and other tools.

Ground impedance alarm levels can be set by the user to satisfy a broad range of requirements and compliance with standards such as ANSI 6.1 and ANSI/ESDA S20.20. Adding additional reliability, the host tool is provided a logic level signal to shut the tool down in case of ground failure. Miniature and unobtrusive, the Ground Man Monitors are easy to install and easy to connect.

Use 3M Ground Man Plus Monitor CTC334 to monitor all important ground connections in the tool and an operator. This monitor adds wrist strap monitoring to allow only properly grounded operators to work with the sensitive devices.

Product No.	Description
CTC333	Ground Man Ground Monitor
CTC334	Ground Man Plus Ground Monitor

Related Products

Dual Conductor Wrist Straps and Cords. . . . . pg. 31
Ground Master Equipment Ground Monitor . . . . . pg. 80
Ground Pro Ground Integrity Meter . . . . . pg. 63
Workstation Monitor . . . . . pg. 78

3M™ Wrist Strap and Ground Monitor 773

Product No.	Description
773	Wrist Strap and Ground Monitor

3M™ Wrist Strap and Ground Monitor 773

Features

- Ground impedance monitoring.
- Adjustable impedance alarm level.
- Enable/Disable for each ground.
- Output to the host tool.
- Operator wrist strap monitoring.
- Operator body voltage monitoring.
- Proprietary replaceable wrist strap jack.
- Audio and visual alarms.
- Sound alarm on/off.

The Wrist Strap and Ground Monitor 773 can be used in work areas or other locations to monitor the ground impedance of metal ground connection in process tools in semiconductor, disk drive, flat panel, electronic equipment manufacturing and other environments. Ground impedance monitoring can be used for up to two points for metal ground, such as within a tool. The Monitor 773 can also be used to monitor the resistance-to-ground and voltage level on two persons wearing dual-wire wrist straps. The unit incorporates green and red LEDs and an audible alarm, as well as an output logic signal to a host piece of equipment. The Monitor 773 comes with a user's guide and an AC/DC adapter.

Related Products

Dual Conductor Wrist Straps and Cords. . . . . pg. 31
Ground Man and Ground Man Plus Ground Monitors . . . . . pg. 81
Ground Master Equipment Ground Monitor . . . . . pg. 80
Ground Pro Ground Integrity Meter . . . . . pg. 63
Workstation Monitor . . . . . pg. 78

Importance of Grounding

Grounding is the most important component of ESD protection. One of the best returns on investment in ESD is by improving and maintaining proper grounding for your equipment and its parts. Good grounding assures that all conductive parts of the tool have the same potential and do not introduce electric overstress and electrostatic discharge during operation of the tool.

Most tools are made up of many parts which are not always connected together. Good mechanical contact does not automatically assure proper electrical contact. Sometimes anodized metal surfaces will make the tool act as an insulator. Moving parts are often grounded via ball bearings which make good contact only when stopped – otherwise the contact is highly intermittent. It is very important to test for proper grounding not only on the tool's frame, but also on all of the conductive parts of the tool – both when the tool is at rest and during use.

Safety is of utmost importance. Tools that are properly grounded will not expose an operator to dangerous high voltage levels in the event of tool malfunction or problems with wiring. Only continuous monitoring can provide the assurance of proper grounding.

3M™ Benchtop Air Ionizer

3M™ Benchtop Air Ionizer 963E

Features

- Fast neutralization of static charges on nonconductive objects. < 2 seconds at 1 ft. (0.3 m) distance using ANSI/ESD S3.1 test procedure.
- Maintains equal balance of positive-negative ions.
- Two-speed fans.
- Static dissipative housing prevents static charge buildup 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, NOM certification. CE-marked.

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 Benchtop Air Ionizer 963E blankets the benchtop with ionized air to help prevent static from damaging sensitive electronics.

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

NOM CE UL LISTED RoHS Compliant 2002/95/EC

Specifications

Property	Typical Values
Operating Voltage and Frequency	AC 220V/230V 50/60 Hz 0. 12A 20W
Power Outlet	IEC 320 Socket
Supplied Power Cord	6' (1.8 m) cord with IEC 320 and Continental Europe (EURO) plugs or US plug
Dimensions	6.0" W x 7.4" H x 3.0" D (15.2 cm W x 18.8 cm H x 7.6 cm D)
Weight	2.5 lb. (1.1 kg)
Air Velocity	low speed - 100 fpm (0.5 m/s) high speed - 300 fpm (1.5 m/s)
Static Discharge Time*	1 ft. (0.3 m) < 1 second at high fan speed 3 ft. (0.9 m) < 5 second at high fan speed
Certifications and Approvals	CE, UL, NOM
Warranty	1-year

(All values are typical, not specifications)
*When tested according to ANSI/ESD S3.1-1991

Related Products

Air Ionizer Test Kit 718A . . . . . pg. 65
Charge Analyzer 711. . . . . pg. 64
Dissipative Rubber Mats/Rolls. . . . . pg. 44
Floor Mats/Runners . . . . . pg. 43
Static Sensor 718 . . . . . pg. 65

3M™ Mini Air Ionizer

3M™ Mini Air Ionizer 960

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.

The 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 is designed to generate a well-balanced flow of ionized air particles, which helps neutralize 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 (± 20 V) of ionized air.

The unit runs off of low-voltage 24 VAC power, which can be supplied by the 3M™ Wall Transformer 960X (sold separately). Included with the ionizer are a mounting bracket and a 3 ft. (0.9 m) telephone cable (with modular plugs) to connect the ionizer to the Wall Transformer 960X.

Related Products

Air Ionizer Test Kit 718A . . . . . pg. 65
Charge Analyzer 711. . . . . pg. 64
Static Sensor 718 . . . . . pg. 65

Product No.	Description
960	Mini Air Ionizer

Mini Air Ionizer 960

Item	Typical Properties
Input Voltage	AC 24 V
Power	5.5 watts
Power Input Connection	RJ-11 socket
Size	4.5 H x 3.3 W x 2 in. D (including bracket) (11.4 x 8.4 x 5.1 cm)
Weight	12 oz. (0.3 kg)
Air Flow Velocity	(@1 ft. in front of grille): 300 ft./min.
Air Flow Volume	22 scfm
Operating Environment	
Temperature	59°F–95°F (15°C–35°C)
Humidity	15%–55% RH, non-condensing
Other Conditions	Product should be used in relatively clean indoor environments
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 120 V, 50/60 Hz, 270 mA
Output	AC 24 V, 1.0 A through RJ-11 socket connector
Dimensions	3.2 H x 2.6 W x 1.9 in.D (8.1 x 6.6 x 4.8 cm)
Weight	16 oz. (0.5 kg)
Certifications	UL, CSA

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

Product No.	Description
960X/980X	Wall Transformer

3M™ Overhead Air Ionizer 991

3M™ Overhead Air Ionizer 991

Using steady-state DC ion emission, the Overhead Air Ionizer 991 provides consistent static control coverage. With its overhead mounting system, the ionizer doesn't compromise valuable space on the workbench. The steady-state DC ion emission allows fast discharge with low airflow, providing a more comfortable work environment for operators. Emitter points are placed behind the fan to virtually eliminate field-induced charge and to provide a homogenous mixture of ionized air. Also featured are open-cell foam filters on the fan intakes, protecting the internal components from environmental contamination.

Product No.	Description
991	Overhead Air Ionizer 991 with North America Power Cord (98-0798-5683-1)
	Overhead Air Ionizer 991 with UK Power Cord (98-0798-5684-9)
	Overhead Air Ionizer 991 with Germany Power Cord (98-0798-5694-8)
	Overhead Air Ionizer 991 with China Power Cord (98-0798-5695-5)

Product No.	Description
991F	Replacement Filters, three filters/pkg

Specifications

Property	Typical Values
Ion Emission	Steady-state (DC)
Emitter Points	0.12 in. (3.0 mm) tungsten wire, internally shielded, 2 year life estimated
Air Flow	114 CFM (per fan, high speed, free-air)
Audible Noise	63 dB, high fan speed ohm 57 dB, low fan speed ohm
Power Inlet	IEC60320 (with removable line cord)
Input Voltage	100-230 Vac, 50/60 Hz, 27 watts max.
Input Current	0.4A max.
Power	27W max.
Discharge Time	≤ 8 seconds directly under each fan at 18 in. (46.0 cm) distance; high fan speed
Offset Voltage Balance	≤ ±20 volts directly under each fan at 18 in. (46.0 cm) distance; high fan speed
Alarm Relay Course	Modular handset jack, rated 1A maximum, 30 volts
Coverage Area	2 ft. W x 4 ft. L (0.6 x 1.2 m) directly under ionizer
Controls	Power/fan speed slide switch: High/Off/Low settings
Indicators	Bi-color LED: green power ON; red power supply failure
Daisy-Chain Capacity	10 units maximum
Chassis	Aluminum with epoxy-polyester powder coated
Mounting	Four eyebolts and 1-1/8 in. S-hooks provided
Dimensions	4 H x 6 W x 44 L in. (10.1 x 15.2 x 111.7 cm)
Operating Environment	
Temperature	50°F–95°F (10°C–35°C)
Humidity	20–55% RH (non-condensing)
Ozone Level	< 0.010 ppm
RoHS Compliant	Yes
Weight	10 lbs. (4.5 kg)
Certifications	cULus, TUV-GS, CE, C-Tick

Related Products

Air Ionizer Test Kit 718A . . . . . pg. 65
Charge Analyzer 711. . . . . pg. 64
Static Sensor 718 . . . . . pg. 65

3M™ Ionized Air Gun

3M™ Ionized Air Gun 980

The 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. Proprietary technology ensures balanced ionization for consistent control of surface charges. The air gun does not need adjustment and requires very little maintenance.

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

Product No.	Description
980E-X	Replacement Wall Transformer, 230 V
980F	Replacement Air Filters (3 per carton)
980T	Replacement Emitter Points
980X	Replacement Wall Transformer, 120 V

Product No.	Description	
980	**Ionized Air Gun** AC 100/120V 50/60 Hz	
	Hand Unit 8.0 H x 3.0 W x 1.0 L in. (20.3 x 7.6 x 2.5 cm)	
	Construction	Dissipative rigid polycarbonate
	Weight	12.0 oz (340.2 g) with 7 ft. (2.1 m) air hose
	Emitter Points	Tungsten alloy
	Air Hose Construction	Dissipative flexible poly-urethane
	Size	7 in. long, 0.38 in. OD 17.8 cm x 1.0 cm
	Filter Efficiency	99.9% for 0.1 micron particle size
	Operating Environment	
	Temperature	59°F–95°F (15°C-35°C)
	Humidity	15%–55% RH, non-condensing
	Other Conditions	Product should be used in relatively clean indoor environments
	Console 8.5 H x 3.0 W x 1.6 L in. (21.6 x 7.6 x 4.1 cm) RoHS compliant	 Yes
980E	**Ionized Air Gun – European version** AC 230V ~ 50/60 Hz	
	Hand Unit 8.0 H x 3.0 W x 1.0 L in. (20.3 x 7.6 x 2.5 cm)	
	Console 8.5 H x 3.0 W x 1.6 L in. (21.6 x 7.6 x 4.1 cm)	

Related Products

Air Ionizer Test Kit 718A . . . . . pg. 65
Charge Analyzer 711. . . . . pg. 64
Static Sensor 718 . . . . . pg. 65

3M™ Equilibrion Ionization Controller and Monitor

3M™ Equilibrion Ionizer Controller

Features

- Brings to zero, keeps at zero from the widest of imbalances.
- Immune to static voltage.
- Reports balance and decay.
- Miniature size.

The Equilibrion Ionizer Controller CTC037 is designed to be completely immune to influence of nearby static charges in ionizer balance. The Equilibrion Ionizer Controller brings the balance of controllable ionizers to zero and keeps it at zero, even as the ionizer tips wear out or build up dirt — dramatically increasing the time between required ionizer maintenance; thus lowering the cost of ionizer ownership.

The Equilibrion Ionization Monitors CTC038 and CTC039 will report the balance of the ionizer and whether its decay is within specification. The CTA236 display module can be used in conjunction with the CTC038 (becomes model number CTK058) and CTC039 (becomes model number CTK059) to provide visual indication of decay and balance.

Equilibrion provides monitoring of ionization decay — the most fundamental property of an ionized environment. Charge decay at places where sensitive components are handled can exceed acceptable levels due to dirty ionizer points, air flow blockage, or a poorly positioned ionizer. With Equilibrion, automatic continuous decay monitoring provides an alarm when decay becomes unacceptable, improving ESD safety in your environment.

3M™ Equilibrion Ionization Controller Monitors CTK058

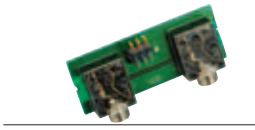
3M™ Equilibrion Ionizer Monitor

	Equilibrion		
	CTC037	*CTC038*	*CTC039*
Type of Ionizer			
DC Blower	x	x	
AC Blower		x	
Pulsed Bar			x
Steady-State Bar			x
AC Bar			x
Alpha	x		
Monitor Type			
Controller	x		
Monitor Only		x	x
Output			
To Ionizer	x		
Digital		x	x
Relay		x	x
Parameters			
Balance	x	x	x
Decay	x	x	x
± Peaks		x	x
External Display Unit	**x**	**Optional**	**Optional**

CTC037 Controller Properties

Item	Typical Properties
Indication	
Balance	LED bar
Decay	3-LED bar
Construction	
Enclosure	Non-tribocharging static-dissipative
Antenna	Integrated
Dimension (max.)	1 H x 2.75 W x 1.85 L in. (2.5 x 7.0 x 4.7 cm)
Weight	2.5 oz (70 g)
Interface	
Type of Ionizer	DC, with control input
Control Input	
RJ11	RJ11 4-conductor cable
BNC Adapter Avaliable — See Ordering Information	
Power	
RJ11 Interface	Ionizer provides power
Power Jack	12 – 24 Vdc <100 mA

3M™ Instrumentation Accessories

Image	Product No.	Description
	723	Accessory Belt Clip to be used with the 3M™ Wrist Strap Monitor 725
	724P	Power Supply for 3M™ Wrist Strap Workstation Monitor 724 and 3M™ Static Monitor 790
	724VK	Monitor Verification Kit. Verifies the resistance range of the Workstation Monitor 724
	725VK	Monitor Verification Kit. Verifies the resistance range of the Wrist Strap 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 3M™ Wrist Strap and Footwear Tester 740
	746P	Power Supply for 3M™ Wrist Strap Tester 746
	790VK	Verification Kit. One 5 ft. (1.5 m) Dual Conductor Cord 2360, one test wrist band socket assembly, and one two-wire male connector with 24 in. (61.0 cm) lead wire.
	3057	Monitor Stand-By Jack. Allows operator to disconnect a ground cord from the wrist band and leave the workstation without deactivating the 3M™ Wrist Strap Workstation Monitor 724 or 3M™ Static Monitor 790.
	**CTA242**	This remote terminal connects to WS Aware workstation monitors and provides connection for dual wire wrist straps for an operator and a visitor. Proprietary plug-in replaceable board with the jacks reduces cost of ownership of the monitor since only one inexpensive board needs to be replaced when the jacks are worn out, instead of the entire terminal.
	CTA243	Before sensitive devices are handled, Big Brother alarms alert the operator to plug-in. Once Big Brother senses that the operator is properly grounded the alarm is silenced. The Big Brother wrist strap terminal makes the WS Aware one of the most intelligent and cost-effective systems on the market today.
	CTA245	Replacement board with jacks for WS Aware remote monitors CTA242 and CTA243.
	CTA251	Replacement Board with Jack for Iron Man Plus Monitor.

Notes

3M™ Static Control Vinyl Floor Tile

3M™ Static Control Vinyl Floor Tile 8400 Series

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 precise squareness for ease of installation.
- Available in 24.25 in. (61.6 cm) size for raised access floors, plus 12 in. (30.5 cm), 24 in. (61.0 cm), and 36 in. (91.4 cm) sizes.
- Available in 12 standard colors; custom colors can be formulated.
- May be seam welded or self-coved.

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 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 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.

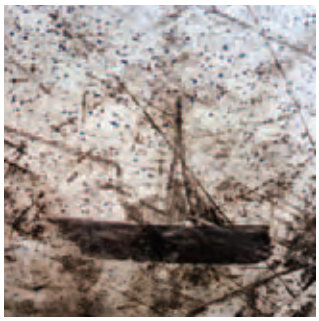
Product No.	Description
Static Dissipative Floor Tile	
8411	Brown
8412	White
8413	Gray
8414	Blue
8415	Green
8416	Maroon
8417	Black
8421	Reverse Brown
8423	Reverse Gray
8424	Reverse Blue
8425	Reverse Green
8427	Reverse Black
Conductive Floor Tile	
8431	Brown
8432	White
8433	Gray
8434	Blue
8435	Green
8436	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

Mechanical Properties

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, 2 hours Residual indentation	 2500 PSI point load 3% of tile thickness 700 PSI point load 1% of tile thickness
Static Load (ASTM F970) 125 lbs, 0.25 in. diameter indentor foot, 24 hours Residual indentation 700 lbs., 1.125 in. diameter indentor foot, 2 hours Residual indentation	 2500 PSI point load 3% of tile thickness 700 PSI point load 1% of tile thickness
Sizes	0.125 H x 12 W x 12 L in. (0.3 x 30.5 x 30.5 cm); 0.125 H x 24.25 W x 24.25 L in. (0.3 x 61.6 x 61.6 cm) -for raised access floor panels 0.125 H x 24.25 W x 24.25 L in. (0.3 x 61.6 x 61.6 cm) 0.125 H x 36 W x 36 L in. (0.3 x 91.4 x 91.4 cm) -for seamwelded installations

Electrical Properties (typical)

Static Dissipative	Conductive
Electrical Resistance (Surface-to-ground, ESD S7.1)	
1 x 10^6 to 1 x 10^9 ohm	2.5 x 10^4 to 1 x 10^6 ohm
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.



1 – subjected to the wear and grime of continual forklift traffic

2 - the high gloss of the restored floor finish is similar to that of the tile when it is newly installed

3 - the high gloss of the restored floor finish is similar to that of the tile when it is newly installed

3M™ ESD Floor Tile 8400 Series is available in the special 24.5 in. x 24.5 in. (622 mm x 622 mm) size used for raised access floor panels.

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

Unique Cleanability

ESD Floor Tile 8400 Series can be repeatedly cleaned and then buffed to a high sheen without ever using wax.

With some other ESD tiles, normal cleaning procedures may dull the finish and can even degrade the electrical properties. 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 demonstrate this feature.

The floor section shown is a test patch of 3M™ 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.

3M™ Antistatic Utility Tape

3M™ Antistatic Utility Tape 40PR

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. 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. 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.

Product No.	Description
40/40PR*	3 in. Antistatic Plastic Cores Antistatic Utility Tape.* Widths, in. (mm) Length, yd. (m) 0.25 (6.4) 72 (65.9) 0.375 (9.5) 72 (65.9) 0.50 (12.7) 72 (65.9) 0.625 (15.9) 72 (65.9) 0.75 (19.1) 72 (65.9) 1 (25.4) 72 (65.9) 1 in. Antistatic Plastic Cores Widths, in. (mm) Length, yd. (m) .50 (12.7) 36 (33.0) .75 (19.1) 36 (33.0)

Specify at time of order. Custom widths available upon request. *PR designation means printed.

Antistatic Utility Tape 40 and 40PR 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	$5 \times 10^6\ \Omega$
Adhesive @ 10% RH	ESD S11.11	$5 \times 10^8\ \Omega$
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%
Shelf Life	2 years [when stored in original packaging at 50°F (10°C) to 80°F (27°C) at 50% RH maximum.]	

3M™ Antistatic Utility Tape Dispenser

3M™ Antistatic Utility Tape Dispenser 620

The Antistatic Utility 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.

Product No.	Description
620	Tape Dispenser Manual Dispenser with base Manual Dispenser without base Replacement Blade

Antistatic Utility Tape Dispenser 620 Properties

Property	Typical Value
Body	Stainless steel frame Accepts tape roll up to 2 in. (5.1 cm) wide. Accepts tape on 3 in. (7.6 cm) core. Unit is shipped with 3 in. dissipative drum.
Blade	Stainless Steel replacement blade
Base	Cast iron Dimensions 5 in. x 9 in. (12.7 cm x 22.9 cm) Weight 7.5 lbs. (3.4 kg)
Decay Time	From 1000 V to < 100 V less than 2 seconds (3 in. core)
Recommended Tapes	Antistatic Film Tape 40 Low Static Polyimide Film Tape 5419

RoHS Compliant 2002/95/EC

3M™ Silicon Adhesive Tape

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 silicon adhesive tape with unique and extremely low electrostatic discharge properties. Use 3M Tape 5419 to mask printed circuit boards during the wave solder or solder dip process.

Product No.	Description
5413	Polyimide Film Tape. Silicon Adhesive. Widths, in. (cm) Length, yd. (m) 0.50 (1.3) 36 (33.0) 0.75 (1.9) 36 (33.0) 1 (2.5) 36 (33.0) 2 (5.1) 36 (33.0)
5419	Low Static Polyimide Film Tape. Silicon Adhesive. Widths, in. (cm) Length, yd. (m) 0.25 (0.6) 36 (33.0) 0.375 (0.9) 36 (33.0) 0.50 (1.3) 36 (33.0) 0.75 (1.9) 36 (33.0) 0.875 (2.2) 36 (33.0) 1 (2.5) 36 (33.0)
Shelf Life	To obtain best performance, use this product within 12 months from date of manufacture and store under normal conditions of 60°F to 80°F (15° to 21°C) and 40 to 50% R.H. in the original carton.

3M™ Water Soluble Tape 5414

3M™ Water Soluble Tape

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
5414	Water Soluble Wave Solder Tape. Widths, in. (mm) Length, yd. (m) 0.5 (1.3) 36 (33.0) 0.75 (1.9) 36 (33.0) 1 (2.5) 36 (33.0)
Shelf Life	To obtain best performance, use this product within 12 months from date of manufacture and store under normal conditions of 60°F to 80°F (15° to 21°C) and 40 to 50% R.H. in the original carton.

3M™ Vinyl Tape 471

3M™ Vinyl Tape

Vinyl Tape 471 is a conformable colored 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 – Width, in. (cm) / Length, yd (m)								
471									
Black - width	0.50 (1.3)	0.75 (1.9)	1 (2.5)	1.5 (3.8)	2 (5.1)	3 (7.6)	4 (10.2)		
- length	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)		
Blue - width	0.25 (0.6)	0.50 (1.3)	0.75 (1.9)	1 (2.5)	2 (5.1)	3 (7.6)			
- length	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)			
Red - width	0.25 (0.6)	0.375 (0.9)	0.5 (1.3)	0.75 (1.9)	1 (2.5)	1.5 (3.8)	2 (5.1)	3 (7.6)	4 (10.2)
- length	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)
White - width	0.25 (0.6)	0.375 (0.9)	0.5 (1.3)	0.75 (1.9)	1 (2.5)	1.5 (3.8)	2 (5.1)	3 (7.6)	4 (10.2)
- length	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)	36 (33.0)

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3M™ Foil Shielding Tape Engineering Kit

Engineering Kit for Foil Shielding Tape

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. (10.2 cm x 10.2 cm x 21.6 cm)

3M™ EMI Shielding Tape

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.

The 3M™ Foil Shielding Tape 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 virtually 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.

Product No.	Description	Width, in. (cm) / Length, yd (m)				
1120	Smooth aluminum foil, conductive acrylic adhesive, 4.0 mil total, supplied on liner.	W 1 (2.5) L 36 (33.0)				
1170	Smooth aluminum foil, conductive acrylic adhesive, 3.2 mil total, supplied on liner.	W 1 (2.5) L 36 (33.0)	0.75 (1.9) 18 (16.5)	0.625 (1.6) 18 (16.5)		
1181	Smooth copper foil, conductive acrylic adhesive, 2.6 mil total, supplied on liner.	W 1 (2.5) L 36 (33.0)	0.75 (1.9) 18 (16.5)	0.5 (1.2) 18 (16.5)	0.375 (.9) 18 (16.5)	0.25 (.6) 18 (16.5)
1182	Smooth copper foil coated on both sides, conductive acrylic adhesive, 3.5 mil total, supplied with liner on each side.	W 1 (2.5) L 36 (33.0)	0.75 (1.9) 18 (16.5)	0.5 (1.3) 18 (16.5)		
1183	Smooth tin-plated copper foil, conductive acrylic adhesive, 2.6 mil total, supplied on liner.	W 1 (2.5) L 36 (33.0)	0.75 (1.9) 18 (16.5)			
1194	Smooth copper foil, nonconductive acrylic adhesive, 3.0 mil total, supplied on liner.	W 1 (2.5) L 36 (33.0)	0.75 (1.9) 36 (33.0)			
1245	Embossed copper foil, nonconductive acrylic adhesive, 4.0 mil total, conductivity “through the adhesive,” supplied on liner.	W 1 (2.5) L 36 (33.0)	0.625 (1.6) 18 (16.5)	0.5 (1.3) 18 (16.5)	0.375 (.9) 18 (16.5)	0.25 (.6) 18 (16.5)
1267	Embossed aluminum foil, nonconductive acrylic adhesive, 5.0 mil. total, conductivity “through the adhesive,” supplied on liner.	W 1 (2.5) L 36 (33.0)				
1345	Embossed tin-plated copper foil, nonconductive acrylic adhesive, 4.0 mil. total, conductivity “through the adhesive,” supplied on liner.	W 1 (2.5) L 36 (33.0)	0.75 (1.9) 18 (16.5)	0.625 (1.6) 18 (16.5)	0.5 (1.3) 18 (16.5)	0.25 (.6) 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. (58.4 cm).

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Notes

3M Hosts ESD Training on Static Control in Austin, Texas

3M offers an in-depth training program on static control at our 3M Austin location. The two-day course is designed for people responsible for implementing or managing a company's ESD program. The course content, constructed for beginner to intermediate levels, covers such topics as:

- The foundations of ESD, including terminology, basic electricity and its relationship to ESD, basic ESD controls and how parts fail.
- How can static electricity be controlled?
- What is EOS, how to detect/measure and monitor it.
- EOS damage compared to ESD damage – characteristics.
- ESD Event detection and measurement/models: HBM, MM, CDM
- What ground to use and how to accurately measure and/or monitor it.
- How to conduct a plant survey or an audit.
- What are appropriate surfacing and grounding materials and techniques?
- How, when, why and where to use static-protective packaging materials?
- Ionization, how to properly test ionizers and how to 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 1-866-722-3736 for registration information and for a class schedule. To view the current agenda, or learn more about 3M training seminars, refer to www.3Mstatic.com.

EOS/ESD Management Assessments

Traditional ESD surveys have been around for many years; however, they are not keeping pace with the current demands in electronics manufacturing. Components continue to become more sensitive, production environments more demanding, and Class 0 handling operations more common. The process of controlling your EOS/ESD environment requires the latest technology to adequately deal with these requirements.

3M diagnostic instrumentation finds and measures actual ESD events and EOS (electrical overstress) situations, instead of simply assessing the potential for such events. Our products capture real data affecting your products versus only verifying whether or not precautionary tools are functioning properly.

The 3M EOS/ESD Management Assessment will assist in helping your company become more competitive in the marketplace by reducing your losses due to EOS/ESD events. The assessment will help your company address concerns or problems associated with EOS/ESD events. By minimizing or eliminating these events, your yields will likely be improved, leading to possible cost savings and increased customer satisfaction.

Contact your 3M Static Control Distributor today for information on having a 3M EOS/ESD Management Assessment conducted in your facility.

S20.20 Standard Requires Training

The ANSI/ESD S20.20 truly breaks new ground in the standardization of static control for electronics, but are you aware that it contains a requirement for training? Training is so fundamental to an effective program of static control that it has been made a requirement under the ANSI/ESD S20.20 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.

If training has been nonexistent or scattered in your organization, you will need to make it a high priority in adopting S20.20. 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? 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. 3M's 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, S20.20 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.

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To request an MSDS, call: (888) 364-3577

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Index

Product Name

Adjustable Elastic Fabric Wrist Strap 27
Air Filter Replacement for Ionized Air Gun 86
Air Ionizer Test Kit 65
Air Ionizer Tester/Field Meter and Charger 65
Air Ionizer, Benchtop 83
Air Ionizer, Mini 84
Air Ionizer, Overhead 85
Aisle Marking Tape 55
Alligator Clip 50
Anti-Fatigue Mat 45
Anti-Fatigue Mat, Vinyl 46
Antistatic Spray, Topical 52
Antistatic Utility Tape 92
Antistatic Utility Tape Dispenser 92
Attention Labels, Destructible 7
Attention Labels, Reusable 8
Barrier Bag MILpac 131 20
Belt Clip 76, 88
Benchtop Air Ionizer 83
Big Brother Alarm 88
Brushes 57
Bulldog Clip 50
Carriers, Single Card 23
Carriers, Single Device 23
Carrying Strap Assembly 57
Caution Labels 7
Charge Analyzer/Charge Plate Monitor 64
Circular Connector Cover 25
Clean Walk Mat 48
Cleaning Products, Worksurface 52
Clip, Alligator 50
Clip, Bulldog 50
Combination Wrist Strap and Footwear Tester 69
Common Point Ground Cord 49
Common Point Grounding System 49
Conductive Bag 21
Conductive Container 23
Conductive Drum Liners 21
Conductive Film 22
Conductive Floor Mat for Hard Floors 44
Conductive Rubber Floor Mat 44
Conductive Tubing 22
Connector Cover, Circular 25
Connector Cover, D Type 25
Container, Hinged 24
Container, Conductive 23
Container, Round 24
Continuous Monitors, Single Wire 79
Cord, Monitor/Table Mat Interconnect 49
Cord, Replacement, Monitor/Table Mat 49
Crevice Nozzle 57
Crevish Brush 57
Cup Style Heel Grounder . . . . . .35 - 38
Cup Style Heel Grounder, D-Ring, High Visibility 36
Cup Style Heel Grounder, High Visibility 36-38
Cup Style Heel Grounder, Quick Clasp 36
Curved Wand Nozzle 57
Cushioned Shielding Wrap 19
Cushioned Static Shielding Bag, Metal-Out 19
Data Logging Software 67
Desiccant 17
Destructible Labels 7
Dispenser, Antistatic Utility Tape 92
Dispenser, Label 8
Disposable Heel Grounder 39
Disposable Wrist Strap 32
Dissipative Hard Laminate Sheets 47
Dissipative Rigid Worksurfaces 47
Dissipative Rubber Mats and Rolls 41
Dissipative Vinyl Mat 43
Dissipative Vinyl Three-Layer Mats and Rolls 42
Dri-Shield 2000 Moisture Barrier Bag 15
Dri-Shield 2000 ZipTop 15
Dri-Shield 2500 Metal-Out Moisture Barrier Bag 16
Dri-Shield 2700 16
Dri-Shield 2700 Moisture Barrier Bag 16
Dri-Shield 3000 Moisture Barrier Bag 13
Dri-Shield 3200 Metal-Out Moisture Barrier Bag 14
Dri-Shield 3400 Moisture Barrier Bag 13
Dri-Shield 3400 ZipTop 13
Dri-Shield 3700 Moisture Barrier Bag 14
Drum Liners, Conductive 21
Dry Packaging Label 18
Dual Conductor Fabric Wrist Band for Monitors 31
Dual Conductor Ground Cord 31
Dual Conductor Metal Wrist Straps for Monitors 31
Dual Conductor Portable Wrist Strap Monitor 76
Dual Conductor Remote Input Jacks 75
Dual Conductor Thermoplastic Wrist Strap for Monitors . . 32
Dusting Brush 57

Index

Electronics Vacuum 56
EM Aware TNG ESD Event Monitor 59
EM Aware TNG ESD Event Monitor Starter Kits. 60
EM Eye Meter 61
EM Eye Meter Modes 62
EMI Shielding Tape. 94
Emitter Point Replacement for Ionized Air Gun 86
Engineering Kit for Foil Shielding Tape. 94
EOS/ESD Management Assessments 96
Equilibrion Ionization Controller and Monitor 87
ESD Pro ESD Event Indicator 63
ESD Training on Static Control 96
ESD Warning Posters 55
ESD Warning Signs 55
Fabric Wrist Band, Dual Conductor 31
Fabric Wrist Straps, Adjustable Elastic. 27
Fastener, Snap, Female 50
Fastener, Snap, Male 50
Field Service Kit Product Selection Guide 53
Field Service Kits 53-54
Film, Conductive 22
Filter Plugs, Long and Short 57
Filter, Fine Particle, Type 1 . . . . . 56, 57
Filter, High Performance, Type 2 . . . . . 56, 57
Filters, Replacement for Overhead Air Ionizer. 85
Filters, Vacuum 56, 57
Floor Mat. 44
Floor Mat, Rubber, Conductive 44
Floor Roll. 44
Foil Shielding Tape, Engineering Kit. 94
Forensics Vacuum 56
Ground Cord 49
Ground Cord Product Selection Guide 48
Ground Cord, Common Point 49
Ground Cords, Wrist Strap 30
Ground Man Ground Monitor 81
Ground Man Plus Ground Monitor. 81
Ground Master Equipment Ground Monitor 80
Ground Pro Ground Integrity Meter 63
Grounding Accessories. 49-50
Grounding Block 50
Grounding Kit for Hard Laminate. 49
Grounding System for Wrist Strap/Table Mat 49
Grounding System, Common Point 49
Grounding System, Wrist Strap 49
Hand Lotion, Static Safe 52
Heat Sealer 8
Heel Grounder Assembly 38
Heel Grounder Product Selection Guide. 33
Heel Grounder, Cup Style 35, 37, 38
Heel Grounder, Cup Style, D-Ring, High Visibility 36
Heel Grounder, Cup Style, High Visibility 36-38
Heel Grounder, Cup Style, Quick Clasp 36
Heel Grounder, Disposable 39
Heel Grounder, Non-Marking 35
Heel Grounder, Standard Style 37
Heel Grounder, Standard Style, High Visibility. 37
Heel Grounders 33-39
HICs 17
Hinged Container. 24
How to Manage Electrical Overstress (EOS) 74
Humidity Indicator Cards 17
Importance of Grounding 82
Instrumentation Accessories. 88
Interconnect Cord 49
Ionized Air Gun 86
Ionized Air Gun, European Version. 86
Ionizers, Air 83-85
Iron Man Plus Workstation Monitor 73
Iron Man Workstation Monitor. 73
Jacks, Dual Conductor Remote Input 75
Label Dispenser. 8
Label, Dry Packaging 10
Labels, Attention, Destructible. 7
Labels, Attention, Reusable. 8
Labels, Caution, Destructible 7
Labels, Destructible 7
Labels, Military, Destructible 7
Labels, Military, Reusable 8
Labels, Reusable 8
Labels, RoHS, Destructible 7
Laminate Sheets, Dissipative, Hard 47
Lotion, Hand, Static Safe 52
Mat, Anti-Fatigue 45
Mat, Anti-Fatigue, Vinyl. 46
Mat, Clean Walk. 48
Mat, Conductive for Hard Floors 44
Mat, Floor 44
Mat, Floor, Rubber, Conductive 44
Mat Kits 43, 44, 46

Index

Product Name

Mat Product Selection Guide 40
Mats 40-48
Mats and Rolls, Dissipative Rubber 41
Metal Wrist Band, Fixed Size. 29
Metal Wrist Strap, Adjustable 30
Metal Wrist Strap, Dual Conductor 31
Metal-In Static Shielding Bag 3
Metal-Out Cushioned Static Shielding Bag 19
Metal-Out Moisture Barrier Bag Dri-Shield 2500 16
Metal-Out Static Shielding Bag 5
MIL Spec Bag 20
Military Labels, Destructible 7
Military Labels, Reusable 8
MILpac 131 Barrier Bag 20
Mini Air Ionizer 84
Moisture Barrier Bag 3370 15
Moisture Barrier Bag Dri-Shield . . . . . .13 - 16
Moisture Barrier Bag Metal-Out Dri-Shield 14, 16
Moisture Barrier Bag SCC 2000MQPL/Military 20
Moisture Barrier Bags 11-16
Moisture Barrier Bags Product Selection Guide 11-12
Monitor Stand-By Jack. 88
Monitor Verification Kit 78, 88
Monitor/Table Mat Interconnect Cord 49
Monitors 59-60, 64, 72-82, 87
Mounting Plate for Static Monitor 77
Needle Nose Nozzle 57
Non-Marking Heel Grounder 35
Nozzles 57
Overhead Air Ionizer 85
Overhead Air Ionizer Replacement Filters. 85
Pedestal Stand 70
Portable Field Service Kits 53, 54
Posters, ESD Warning 55
Power Receptacle Replacement with Filter 57
Power Supply for Monitors 88
Power Supply for Wrist Strap and Footwear Tester 88
Power Supply for Wrist Strap Tester 88
Product Selection Guide, Field Service Kit 53
Product Selection Guide, Ground Cord 48
Product Selection Guide, Heel Grounder 33
Product Selection Guide, Mat 40
Product Selection Guide, Moisture Barrier Bag. 11-12
Product Selection Guide, Static Shielding Bag 2
Product Selection Guide, Wrist Strap 26
Puncture Resistant Metal-In Static Shielding Bag. 6
Puncture Resistant Metal-Out Static Shielding Bag 6
Remote Input Jack Replacement 88
Remote Splitter Kit 88
Remote Terminal 88
Replacement Board with Jacks for WS Aware 88
Replacement Cord, Monitor/Table Mat 49
Reusable Attention Label 8
Reusable Labels 8
Reusable Military Label 8
RoHS Label 7
Rolls and Mats, Dissipative Rubber 41
Rolls and Mats, Dissipative Vinyl, Three-Layer 42
Rolls, Floor 44
Round Container 24
Rubber Floor Mat, Conductive. 44
Rubber Mat, Ultra-R2 43
Rubber Mats and Rolls, Dissipative 41
S20.20 Standard Requires Training. 96
Sealer, Heat 8
Sealers, Vacuum 18
Sheet Protectors, Static Dissipative 52
Shoe Electrode 69
Shoe Grounder Assembly 35
Shoes/Wrist Strap Tester 68
Signs 55
Signs, ESD 55
Signs, Warning 55
Silicon Adhesive Tape. 93
Single Card Carrier 23
Single Device Carrier 23
Single Wire Continuous Monitor 79
Snap Fastener 50
Snap Fastener, Female. 50
Snap Fastener, Male 50
Snap Tool 50
Snaps, Socket 50
Snaps, Stud. 50
Socket Snaps 50
Soldering Tool 50
Sole Grounder, Front 34
Sole Grounder, Full Coverage 34
Stack Jack 50
Stand-By Jack Dual Conductor Wrist Straps and Cords . . 77
Static Control Vinyl Floor Tile. 90, 91

Static Dissipative Sheet Protectors 52
Static Monitor 77
Static Safe Hand Lotion 52
Static Sensor 65
Static Shielding Bag, Metal-In, SCC 1000 3
Static Shielding Bag, Metal-Out Cushioned 19
Static Shielding Bag, Metal-Out, SCC 1500 5
Static Shielding Bag, Puncture Resistant
Metal-In, SCC 1300 6
Static Shielding Bag, Puncture Resistant
Metal-Out, 2100R 6
Static Shielding Bag, ZipTop 9
Static Shielding Bags 2-6
Static Shielding Bags Product Selection Guide 2
Stud Snaps 50
Surface Resistance Meter 67
Tape Dispenser, Antistatic Utility 92
Tape, Antistatic Utility 92
Tape, EMI Shielding 94
Tape, Silicon Adhesive 93
Tape, Vinyl 93
Tape, Water Soluble 93
TapeTop Adhesive Closure Bag 9
Test Kits for Static Control Surfaces 66
Thermoplastic Wrist Strap, Adjustable 29
Thermoplastic Wrist Strap, Dual Conductor 32
Tile, Static Control Vinyl Floor 90-91
Toe Grounder 39
Toe Grounder Assembly 39
Topical Antistatic Spray 52
Tubing, Conductive 22
Ultra-R2 Rubber Mat 43
Utility Tape, Antistatic 92
Vacuum Accessories, Electronic 57
Vacuum Accessories, Forensics 56
Vacuum Hose Assembly 57
Vacuum Sealers 18
Vacuum, Electronic 56
Vacuum, Forensics 56
Verification Kit 88
Verification Kit for Static Monitor 77
Vinyl Anti-Fatigue Mats 46
Vinyl Floor Tile, Static Control 90-91
Vinyl Mat, Dissipative 43
Vinyl Mat, Homogenous 43
Vinyl Mats and Rolls, Dissipative, Three-Layer 42
Vinyl Tape 93
Wall Transformer 84
Wall Transformer Replacement for Ionized Air Gun 86
Water Soluble Tape 93
Workstation Monitor 75
Workstation Monitor Checker 78
Worksurface Cleaning Products 52
Worksurfaces, Dissipative, Rigid 47
Wrist Band, Dual Conductor Fabric 31
Wrist Band, Metal, Fixed Size 29
Wrist Strap and Footwear Tester 69
Wrist Strap and Footwear Tester, Combination 69
Wrist Strap and Ground Monitor 82
Wrist Strap Dual Conductor Metal 31
Wrist Strap Ground Cords 30
Wrist Strap Grounding System 49
Wrist Strap Monitor, Dual Conductor Portable 76
Wrist Strap Product Selection Guide 26
Wrist Strap Tester 70
Wrist Strap, Metal, Adjustable 30
Wrist Strap/Shoes Tester 68
Wrist Straps 27-32
Wrist Strap, Adjustable Elastic Fabric 27-29
Wrist Strap, Adjustable Thermoplastic 29
Wrist Strap, Disposable 32
Wrist Strap, Economy Performance 28-29
Wrist Strap, Premium Performance 27, 29-30
Wrist Strap, Standard Performance 28
WS Aware Dual Workstation Monitor 72
ZipTop Static Shielding Bag 2, 9

Product Number

3HIC125 Humidity Indicator Card 17
3M034-030-TNG EM Aware TNG ESD Event Monitor 59
3M034-031-TNG EM Aware TNG ESD Event Monitor 59
3M034-3-TNG EM Aware TNG ESD Event Monitor 59
3M1A4-C-TNG EM Aware TNG ESD Event Monitor
Starter Kit 60
3M1AM4-C-TNG EM Aware TNG ESD Event Monitor
Starter Kit 60
3M2A6-C-TNG EM Aware TNG ESD Event Monitor
Starter Kit 60
3M2AM6-C-TNG EM Aware TNG ESD Event Monitor
Starter Kit 60

Index

Product Number

3M3A5-C-TNG EM Aware TNG ESD Event Monitor Starter Kit . . . 60
3M3AM5-C-TNG EM Aware TNG ESD Event Monitor Starter Kit . . . 60
4HIC100 Humidity Indicator Card . . . 17
6HIC200 Humidity Indicator Card . . . 17
35VACUSEAL Standard Vacuum Sealer . . . 18
40 Antistatic Utility Tape . . . 92
82A1 Floor Roll, Brown . . . 42
82A3 Floor Roll, Gray . . . 42
82A4 Floor Roll, Blue . . . 42
88A0 Table Mat, Gray . . . 41
88A1 Table Mat, Blue . . . 41
88A2 Table Mat, Green . . . 41
113LABEL Dry Packaging Label . . . 18
235VACUSEAL Economy Vacuum Sealer . . . 18
471 Vinyl Tape . . . 93
497AJM Electronics Vacuum . . . 56
497AJW Forensics Vacuum . . . 56
620 Antistatic Utility Tape Dispenser . . . 92
635VACUSEAL Premium Vacuum Sealer . . . 18
701 Test Kit for Static Control Surfaces . . . 66
701-L Test Leads . . . 66
701-M Megohmmeter . . . 66
701-W Test Weight . . . 66
711 Charge Analyzer/Charge Plate Monitor . . . 64
718 Static Sensor . . . 65
718A Air Ionizer Test Kit . . . 65
723 Belt Clip . . . 76
724 Workstation Monitor . . . 75
724P Power Supply . . . 88
724VK Verification Kit . . . 78, 88
725 Wrist Strap Monitor . . . 76
725VK Verification Kit . . . 78, 88
732 Dual Conductor Remote Input Jack . . . 75, 88
733 Remote Splitter Kit . . . 75, 88
740 Wrist Strap and Footwear Tester . . . 69
740P Power Supply . . . 88
741 Shoe Electrode . . . 69
746 Wrist Strap Tester . . . 70
746P Power Supply . . . 88
747 Shoes/Wrist Strap Tester . . . 68
747DLS Data Logging Software . . . 67, 68
749 Pedestal Stand . . . 70
773 Wrist Strap and Ground Monitor . . . 82
790 Static Monitor . . . 77
790MP Mounting Plate for Static Monitor . . . 77
790VK Verification Kit . . . 77, 78, 88
960 Mini Air Ionizer . . . 84
960X Wall Transformer . . . 84
963E Benchtop Air Ionizer . . . 83
980 Ionized Air Gun . . . 86
980E Ionized Air Gun, European Version . . . 86
980E-X Replacement Wall Transformer . . . 86
980F Replacement Air Filters . . . 86
980T Replacement Emitter Points . . . 86
980X Replacement Wall Transformer . . . 86
991 Overhead Air Ionizer . . . 85
991F Replacement Filters . . . 85
1120 EMI Shielding Tape . . . 94
1170 EMI Shielding Tape . . . 94
1181 EMI Shielding Tape . . . 94
1182 EMI Shielding Tape . . . 94
1183 EMI Shielding Tape . . . 94
1194 EMI Shielding Tape . . . 94
1245 EMI Shielding Tape . . . 94
1267 EMI Shielding Tape . . . 94
1345 EMI Shielding Tape . . . 94
1704 Conductive Film, Short Roll . . . 22
1706 Conductive Film, Short Roll . . . 22
1708 Conductive Film, Short Roll . . . 22
1724 Conductive Tubing . . . 22
1764 Conductive Film, Long Roll . . . 22
1864 Floor Mat . . . 44
1864R Floor Roll . . . 44
2000MQPL Military Moisture Barrier Bag . . . 20
2004 Conductive Bag . . . 21
2014 Conductive Drum Liners . . . 21
2044 Economy Shoe Grounder Assembly . . . 38
2051 Shoe Grounder Assembly . . . 35
2053 Toe Grounder Assembly . . . 39
2100 Puncture Resistant Metal-Out Static Shielding Bag ZipTop . . . 9
2100R Puncture Resistant Metal-Out Static Shielding Bag . . . 6
2110R Reclosable ZipTop Static Shielding Bag . . . 9
2120R Metal-Out Cushioned Static Shielding Bags . . . 19
2126R Cushioned Shielding Wrap . . . 19
2204 Adjustable Fabric Wrist Band . . . 27

Index

2205 Metal Wrist Band, Fixed Size Metal, Premium Performance 29
2206 Metal Wrist Band, Fixed Size Metal, Premium Performance 29
2207 Metal Wrist Band, Fixed Size Metal, Premium Performance 29
2209 Disposable Wrist Strap 32
2210 Ground Cord. 30
2214 Adjustable Fabric Wrist Band. 27
2220 Ground Cord. 30
2271 Wrist Strap, Adjustable Elastic Fabric, Economy Performance 28
2272 Wrist Strap, Adjustable Elastic Fabric, Economy Performance 28
2360 Dual Conductor Coiled Cord 31
2360R Dual Conductor Coiled Cord 31
2368 Dual Conductor Adjustable Fabric Wrist Band. 31
2368VM Dual Conductor Adjustable Fabric Wrist Band . . 31
2370 Dual Conductor Coiled Cord 31
2370R Dual Conductor Coiled Cord 31
2371 Dual Conductor Coiled Cord 31
2371R Dual Conductor Coiled Cord 31
2380 Monitor/Table Mat Replacement Cord 49
2381 Dual Conductor Metal Wrist Strap 31
2382 Dual Conductor Metal Wrist Strap 31
2383 Dual Conductor Metal Wrist Strap 31
2384 Dual Conductor Metal Wrist Band 31
2385 Dual Conductor Metal Wrist Band 31
2386 Dual Conductor Metal Wrist Band 31
2389 Monitor/Table Mat Interconnect Cord. 49
3033 Snap Fastener 50
3034 Snap Fastener 50
3037 Insulated Bulldog Clip 50
3038 Uninsulated Alligator Clip. 50
3040 Ground Cord. 49
3041 Grounding Kit 49
3042 Wrist Strap Grounding System. 49
3043 Interconnect Cord. 49
3047 Common Point Grounding System 49
3048 Grounding System 49
3050 Snap Fastener 50
3051 Ground Cord. 49
3057 Stand-By Jack Dual Conductor Wrist Strap and Cord 77, 88
3370 Moisture Barrier Bag. 15
4011 Round Container. 24
4012 Round Container. 24
4013 Round Container. 24
4014 Round Container. 24
4015 Round Container. 24
4021 Hinged Container 24
4022 Hinged Container 24
4023 Hinged Container 24
4024 Hinged Container 24
4025 Hinged Container 24
40PR Antistatic Utility Tape. 92
4270 Circular Connector Cover 25
4272 D Type Connector Cover 25
4610 Ground Cord. 30
4611 Ground Cord. 30
4620 Wrist Strap, Adjustable Thermoplastic, Economy Performance 29
4650 Wrist Strap, Adjustable Thermoplastic, Economy Performance 29
4720 Dual Conductor Wrist Band 32
5402 Disposable Heel Grounder. 39
5410 Static Dissipative Sheet Protectors. 52
5411 Static Dissipative Sheet Protectors. 52
5413 Silicon Adhesive Tape, Polyimide Film 93
5414 Water Soluable Wave Solder Tape 93
5419 Silicon Adhesive Tape, Low Static Polyimide Film . . 93
5701 Single Device Carrier 23
5830 Clean Walk Mat 48
7101 Attention Label, Reusable 8
7102 Attention Label, Destructible 7
7201 Military Label, Reusable 8
7202 Military Label, Destructible, 2 in. x 2 in. 7
7204 Military Label, Destructible, 4 in. x 4 in. 7
7203 Military Label, Reusable 8
8001 Surface Mark Remover 52
8201 Floor Mat, Brown 42
8203 Floor Mat, Gray. 42
8204 Floor Mat, Blue. 42
8211 Table Mat, Brown 42
8213 Table Mat, Gray 42
8214 Table Mat, Blue. 42
8221 Table Mat, Brown 42
8223 Table Mat, Gray 42
8224 Table Mat, Blue. 42
8231 Table Roll, Brown 42

Index

Product Number

8233 Table Roll, Gray 42
8234 Table Roll, Blue 42
8241 Table Roll, Brown 42
8243 Table Roll, Gray 42
8244 Table Roll, Blue 42
8251 Floor Roll, Brown 42
8253 Floor Roll, Gray 42
8254 Floor Roll, Blue 42
8261 Table Roll, Brown 42
8263 Table Roll, Gray 42
8264 Table Roll, Blue 42
8271 Table Roll, Brown 42
8273 Table Roll, Gray 42
8274 Table Roll, Blue 42
8281 Table Roll, Brown 42
8283 Table Roll, Gray 42
8284 Table Roll, Blue 42
8291 Floor Roll, Brown 42
8293 Floor Roll, Gray 42
8294 Floor Roll, Blue 42
8343 Static Dissipative Rigid Worksurface, Beige 47
8344 Static Dissipative Rigid Worksurface, Gray 47
8353 Static Dissipative Rigid Worksurface, Beige 47
8354 Static Dissipative Rigid Worksurface, Gray 47
8360 Static Dissipative Hard Laminate Sheet, Beige 47
8365 Static Dissipative Hard Laminate Sheet, Gray 47
8375 Static Dissipative Hard Laminate Sheet, White 47
8403 Conductive Adhesive 90
8405 Calcium Chloride Moisture Test Kit 90
8411 Static Dissipative Floor Tile, Brown 90
8412 Static Dissipative Floor Tile, White 90
8413 Static Dissipative Floor Tile, Gray 90
8414 Static Dissipative Floor Tile, Blue 90
8415 Static Dissipative Floor Tile, Green 90
8416 Static Dissipative Floor Tile, Maroon 90
8417 Static Dissipative Floor Tile, Black 90
8421 Static Dissipative Floor Tile, Reverse Brown 90
8423 Static Dissipative Floor Tile, Reverse Gray 90
8424 Static Dissipative Floor Tile, Reverse Blue 90
8425 Static Dissipative Floor Tile, Reverse Green 90
8427 Static Dissipative Floor Tile, Reverse Black 90
8431 Conductive Floor Tile, Brown 90
8432 Conductive Floor Tile, White 90
8433 Conductive Floor Tile, Gray 90
8434 Conductive Floor Tile, Blue 90
8435 Conductive Floor Tile, Green 90
8436 Conductive Floor Tile, Maroon 90
8437 Conductive Floor Tile, Black 90
8441 Conductive Floor Tile, Reverse Brown 90
8443 Conductive Floor Tile, Reverse Gray 90
8444 Conductive Floor Tile, Reverse Blue 90
8445 Conductive Floor Tile, Reverse Green 90
8447 Conductive Floor Tile, Reverse Black 90
8501 Portable Field Service Kit 54
8505 Portable Field Service Kit 53
8507 Portable Field Service Kit 54
8520 Single Card Carrier 23
8521 Single Card Carrier 23
8522 Single Card Carrier 23
8523 Single Card Carrier 23
8800 Table Roll, Gray 41
8801 Table Roll, Blue 41
8810 Table Mat, Gray 41
8811 Table Mat, Blue 41
8812 Table Mat, Green 41
8820 Table Roll, Gray 41
8821 Table Roll, Blue 41
8822 Table Roll, Green 41
8830 Table Mat, Gray 41
8831 Table Mat, Blue 41
8832 Table Mat, Green 41
8840 Table Roll, Gray 41
8841 Table Roll, Blue 41
8842 Table Roll, Green 41
8850 Table Roll, Gray 41
8851 Table Roll, Blue 41
8852 Table Roll, Green 41
8860 Table Roll, Gray 41
8861 Table Roll, Blue 41
8862 Table Roll, Green 41
8870 Floor Mat, Gray 41
8871 Floor Mat, Blue 41
8872 Floor Mat, Green 41
8890 Floor Roll, Gray 41
8891 Floor Roll, Blue 41
9900 Static Control Anti-Fatigue Mat 45
9910 Static Control Anti-Fatigue Roll 45
9920 Static Control Anti-Fatigue Mat 45
51015HIC125 Humidity Indicator Card 17
51060HIC125 Humidity Indicator Card 17
500210 Heat Sealer 12 in. 8
600210 Heat Sealer 16 in. 8

Alpha Product Number

AISLETAPE54 Aisle Marking Tape 55
ALABEL Attention Label, Destructible 7
ALABEL5/8X2 Attention Label, Destructible 7
AMWS Adjustable Metal Wrist Band 30
AMWS121M Adjustable Metal Wrist Band 30
AMWS61M Adjustable Metal Wrist Band 30
ANTISTAT1GAL Topical Antistat Spray 52
ANTISTAT1QT Topical Antistat Spray 52
BLCC121M Coiled Cord 28
BLCC61M Coiled Cord 28
BLUE-HGC1MD Heel Grounder, Cup Style, D-Ring, High Visibility 36
BLUEWS Fabric Wrist Band 28
BLUEWS121M Fabric Wrist Band 28
BLUEWS61M Fabric Wrist Band 28
CC121M Coiled Cord 27
CC61M Coiled Cord 27
CGC151M Common Point Grounding System 49
CLABEL2X2 Caution Label, Destructible 7
CLABEL4X4 Caution Label, Destructible 7
COMBOTESTER Combination Wrist Strap and Footwear Tester 69
CTA236 Display Module 87
CTA242 Remote Terminal for WS Aware 72, 88
CTA243 Big Brother Alarm 72, 88
CTA245 Replacement Board with Jack 88
CTA251 Replacement Board with Jack 88
CTC021 ESD Sensor 61
CTC022 ESD Sensor, 20KV 61
CTC028 EMI Sensor 61
CTC029 RF Sensor 61
CTC037 Equilibrion Ionization Controller and Monitor 87
CTC038 Equilibrion Ionization Monitor 87
CTC039 Equilibrion Ionization Monitor 87
CTC061 WS Aware Dual Workstation Monitor 72
CTC062 WS Aware Dual Workstation Monitor 72
CTC065 Ground Master Equipment Ground Monitor 80
CTC330 Iron Man Workstation Monitor 73
CTC331 Iron Man Plus Workstation Monitor 73
CTC333 Ground Man Ground Monitor 81
CTC334 Ground Man Plus Ground Monitor 81
CTE701A Workstation Monitor Checker 78
CTK058 Equilibrion Ionization Monitor 87
CTK059 Equilibrion Ionization Monitor 87
CTM048-21 EM Eye Meter with ESD Sensor 61
CTM048-2122 EM Eye Meter with ESD Sensor and 20KV ESD Sensor 61
CTM048-2128 EM Eye Meter with ESD and EMI Sensors 61
CTM048-212829 EM Eye Meter with ESD, EMI and RF Sensors 61
CTM048-22 EM Eye Meter with 20KV ESD Sensor 61
CTM048-28 EM Eye Meter with EMI Sensor 61
CTM048-2829 EM Eye Meter with EMI and RF Sensors . 61
CTM048-29 EM Eye Meter with RF Sensor 61
CTM051 Ground Pro Ground Integrity Meter 63
CTM082 ESD Pro ESD Event Indicator 63
Dri-Shield 2000 Moisture Barrier Bag 15
Dri-Shield 2000 ZipTop 15
Dri-Shield 2500 Metal-Out Moisture Barrier Bag 16
Dri-Shield 2700 Moisture Barrier Bag 16
Dri-Shield 3000 Moisture Barrier Bag 13
Dri-Shield 3200 Metal-Out Moisture Barrier Bag 14
Dri-Shield 3400 Moisture Barrier Bag 13
Dri-Shield 3400 ZipTop 13
Dri-Shield 3700 Moisture Barrier Bag 14
DRILABEL Dry Packaging Label 18
ECWS61M-1 Wrist Strap, Adjustable Elastic Fabric, Economy Performance 29
ESDSIGN4X10 ESD Warning Sign 55
ESDSIGN8.5X11 ESD Warning Sign 55
FF1 Single-use Sealed Filter 56
FGC150M Beveled Cap 49
FGC151M Beveled Cap 49
FPSNAP Prong Clinch Snap 50
FSG1M-L Front Sole Grounder Assembly, Large 34
FSG1M-M Front Sole Grounder Assembly, Medium 34
FSG1M-S Front Sole Grounder Assembly, Small 34
FSKL3RD Field Service Kit 54
HGC1M Heel Grounder, Cup Style 35
HGC1M-C Heel Grounder, Cup Style, Quick Clasp 36
HGC1M-EC Heel Grounder, Cup Style, Economy 38
HGC1M-ECG Heel Grounder, Cup Style, Economy, High Visibility 38
HGC1M-N72-BLU Heel Grounder, Cup Style, High Visibility 36
HGC1M-ORG Heel Grounder, Wide Sole 37
HGS1M Heel Grounder, Standard Style 37
HGS1MD-RED Heel Grounder, Standard Style, High Visibility 37

Index

Alpha Product Number

LABELDISPNSR Label Dispenser 8
LOTION1GAL Static Safe Hand Lotion 52
LOTION8OZ Static Safe Hand Lotion 52
LPCGC150M Common Point Grounding Cord 49
LPCGC151M Common Point Grounding Cord 49
MILpac131 Barrier Bag MIL-PRF-131 20
MWS Fabric Wrist Band 28
MWS121M Fabric Wrist Band 28
MWS61M Fabric Wrist Band 28
NS-HGC1M Heel Grounder, Non-Marking 35
RACC121M Coiled Cord 27
RACC61M Coiled Cord 27
RoHSLABEL RoHS Label, Destructible 7
SCC 1000 Metal-In Static Shielding Bag, Open Top 3, 4
SCC 1000 Reclosable ZipTop Static Shielding Bag 3
SCC 1000 Static Shielding Bag, ZipTop 9
SCC 1300 Puncture Resistant Metal-In Static Shielding Bag 6
SCC 1300 Reclosable ZipTop Static Shielding Bag 9
SCC 1500 Metal-Out Static Shielding Bag 5
SCC 1500 Reclosable ZipTop Static Shielding Bag 9
SCC-625 Surface Resistance Meter 67
SG1M-L Full Coverage Sole Grounder Assembly, Large 34
SG1M-S Full Coverage Sole Grounder Assembly, Small 34
SG1M-XL Full Coverage Sole Grounder Assembly, Extra Large 34
SIGN17X22E ESD Warning Poster 55
SIGN17X22S ESD Warning Poster 55
SNAPSOCKET3/8 Socket Snap 50
SNAPSTUD3/8 Stud Snap 50
SNAPTOOL Snap Tool 50
SP3010 Soldering Tool 50
SRMETER Surface Resistance/Resistivity RTG Meter 67
STACKJACK Stacking Banana Jack Adapter 50
SV-CB1 Crevice Brush 57
SV-CN1 Crevice Nozzle 57
SV-CS1 Carrying Strap Assembly 57
SV-DBSD1 Dusting Brush 57
SV-LRP Long Red Filter Plug 57
SV-MPF1 Filter, Type 1 . . . . . 56, 57
SV-MPF2 Filter, Type 2 . . . . . 56, 57
SV-NN Needle Nose Nozzle 57
SV-PCR3 Power Receptacle Replacement with Filter 57
SV-SH32 Vacuum Hose Assembly 57
SV-SRP Short Red Filter Plug 56, 57
SV-WA2 Curved Wand Nozzle 57
TG1M Toe Grounder 39
WBB-AFWS Fabric Wrist Band 27
WBB-AFWS121M Fabric Wrist Band 27
WBB-AFWS61M Fabric Wrist Band 27
WSGR2 Metal Grounding Block 50
WSMONITOR1 Continuous Monitor, Single Wire 79
WSMONITOR2 Continuous Monitor, Single Wire 79
WSMONITOR3 Continuous Monitor, Single Wire 79

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