ESD Standards

The following list details several major electrostatic discharge (ESD) standards and reference documents in place worldwide.

ESD Association Standards

ANSI EOS/ESD S8.1:1993—ESD awareness symbols.
ANSI ESD S1.1:1998—Evaluation, acceptance, and functional testing of wrist straps.
ANSI ESD S4.1:1997—Work surfaces—Resistance measurements.
ANSI ESD S6.1:1999—Grounding—Recommended practice.
ANSI ESD S11.31:2001—Evaluating the performance of electrostatic discharge shielding bags.
ANSI ESD S20.20:1999—Standard for the development of an ESD control program.
ANSI ESD SP3.3:2000—Periodic verification of air ionizers.
ANSI ESD STM2.1:1997—Resistance test method for electrostatic discharge protective garments.
ANSI ESD STM3.1:1991 (R2000)—Ionization.
ANSI ESD STM4.2:1998—Work surfaces—Charge dissipation characteristics.
ANSI ESD STM5.2:1999—Electrostatic discharge sensitivity testing—Machine model.
ANSI ESD STM5.3.1:1999—Charged device model (CDM)—Component level.
ANSI ESD STM9.1:2001—Resistive characterization of footwear.
ANSI ESD STM11.12:2000—Volume resistance measurement of static dissipative planar materials.
ANSI ESD STM12.1:1997—Seating—Resistive characterization.
ANSI ESD STM97.1:1999—Floor materials and footwear—Resistance in combination with a person.
ANSI ESD STM97.2:1999—Floor materials and footwear—Voltage measurement in combination with a person.
ESD DS9.2:2003—Foot grounders—Resistive characterization.
ESD S541:2003—Packaging materials for ESD sensitive items.
ESD SP10.1:2000—Automated handling equipment.
ESD STM5.1:2001—Electrostatic discharge sensitivity testing—Human body model.
ESD STM7.1:2001—Floor materials—Resistive characterization of materials.
ESD STM11.11:2001—Surface resistance measurement of static dissipative planar materials.
ESD STM13.1:2000—Electrical soldering and desoldering hand tools.

ESD Association Advisory Documents

ESD ADV1.0:1994—Glossary of terms.
ESD ADV3.2:1995—Selection and acceptance of air ionizers.
ESD ADV11.2:1995—Triboelectric charge accumulation testing.
ESD ADV53.1:1995—ESD protective workstations.

ESD Association Technical Reports

ESD TR 01:1999—Can static electricity be measured?
ESD TR 02:1999—High-resistance ohmmeters—Voltage measurements.
ESD TR 03:1999—Glove and finger cots.
ESD TR 04:1999—EOS safe soldering iron requirements.
ESD TR 06:2000—Static electricity hazards of triboelectrically charged garments.
ESD TR 07:2000—Calculation of uncertainty associated with measurement of electrostatic discharge (ESD) current.
ESD TR 08:2000—Socket device model (SDM) tester.
ESD TR 09:2000—Transient-induced latch-up (TLU).
ESD TR 10-01—Machine model (MM) electrostatic discharge (ESD) investigation—Reduction in pulse number and delay time.
ESD TR 11-01—Electrostatic guidelines and considerations for cleanrooms and clean manufacturing.
ESD TR 12-01—Survey of constant (continuous) monitors for wrist straps.
ESD TR 13-02—Alternate techniques for measuring ionizer offset voltage and discharge time.
ESD TR 14-02—Measurement and ESD control issues for automated equipment handling of ESD sensitive devices below 100 V.
ESD TR 15-02—Survey of static control work surfaces and grounding mechanisms.
ESD TR 16-03—Voltage and energy susceptible device concepts, including latency considerations.
ESD TR 20.20—ESD handbook.

Other Standards

AATCC 134:2001—Electrostatic propensity of carpets.
AFLCR 65-8:1998—Maintenance—Engineering and supply: Electrostatic discharge (ESD) control program.
ANSI C37.06:2000—American national standard for switchgear—Ac high-voltage circuit breakers rated on a symmetrical current basis—Preferred ratings and related required capabilities.
ANSI C37.06.1:2000—American national standard trial-use guide for high-voltage circuit breakers rated on a symmetrical current basis—Designated "Definite purpose for fast transient recovery voltage rise times."
ANSI C37.16:2000—American national standard for switchgear—Low-voltage power circuit breakers and ac power circuit protectors—Preferred ratings, related requirements, and application recommendations.
ANSI C37.17:1997—American national standard for trip devices for ac and general-purpose dc low-voltage power circuit breakers.
ANSI C37.22:1997—American national standard preferred ratings and related required capabilities for indoor ac medium-voltage switches used in metal-enclosed switchgear.
ANSI C63.14:1998—American national standard dictionary for technologies of electromagnetic compatibility (EMC), electromagnetic pulse (EMP), and electrostatic discharge (ESD)—Dictionary of EMC/EMP/ESD terms and definitions.
ANSI C63.16:1993—American national standard guide for electrostatic discharge test methodologies and criteria for electronic equipment.
ANSI N322:1997—American national standard inspection, test, construction, and performance requirements for direct reading electrostatic/electroscope–type dosimeters.
ANSI T1.308:1996 (R2002)—Central office equipment—Electrostatic discharge immunity requirements.
ASTM D257:1999—Standard test methods for dc resistance or conductance of insulating materials.
ASTM D991:1989 (R2000)—Standard test method for rubber properties—Volume resistivity of electrically conductive and antistatic products.
ASTM D2679:1973 (R1978)—Standard test method for electrostatic charge.
ASTM D5077:1990 (R1997)—Standard terminology

relating to electrostatic discharge (ESD) packaging materials.

ASTM E1549:1993 (R2000)—Standard specification for ESD-controlled garments required in cleanrooms and controlled environments for spacecraft for nonhazardous and hazardous operations.

ASTM E2042:1999—Standard practice for cleaning and maintaining controlled areas and cleanrooms.

ASTM F150:1998—Standard test method for electrical resistance of conductive and static dissipative resilient flooring.

ASTM F1812:2002—Standard test method for determining the effectiveness of membrane switch ESD shielding.

BS 6654:1985 (R1996)—Method for determination of the electrical resistivity of textile floor coverings.

BS EN 1149-1:1996—Protective clothing—Electrostatic properties—Surface resistivity (test methods and requirements).

BS EN 1149-2:1997—Protective clothing—Electrostatic properties—Test method for measurement of the electrical resistance through a material (vertical resistance).

BS EN 1718:1999—Light conveyor belts—Test method for the measurement of the electrostatic field generated by a running light conveyor belt.

CECC 00015P1:1991—Basic specification for protection of electrostatic sensitive devices.

DI-ATTS-80285B:1997—Engineering support data.

DI-RELI-80669:1992—Electrostatic discharge (ESD) control program plan.

DI-RELI-80671A:1992—Handling procedures for electrostatic discharge (ESD) sensitive items.

EIA 471:1980 (R1996)—Symbol and label for electrostatic sensitive devices.

EIA 541—Packaging material standards for ESD sensitive items.

EIA 541:1988—Packaging material standards for ESD-sensitive items.

EIA 541:1990—Packaging of electronic products for shipment.

EIA 545:1989—Electromechanical switch test method for electrostatic discharge (ESD).

EIA 625:2000—Handling electrostatic discharge sensitive (ESDS) devices.

EN 50348:2001—Automatic electrostatic spraying equipment for nonflammable liquid spraying material.

EN 61340-5-1:2001—Protection of electronic devices from electrostatic phenomena—General requirements.

EN 61340-5-2:2001—Protection of electronic devices from electrostatic phenomena—User guide.

EOS/ESD EP102:1989—Electrostatic discharge and electronic equipment: A practical guide for designing to prevent ESD problems.

EOS/ESD EP103:1990—ESD program management: A realistic approach to continuous, measurable improvement in static control.

EOS/ESD EP105:1995—ESD in silicon integrated circuits.

FTS 101C 4046—Electrostatic properties of materials.

IDEMA ESD1-00—MR and GMR heads—General practices for ESD control.

IEC 60236:1974—Methods for the designation of electrostatic deflecting electrodes of cathode-ray tubes.

IEC 60255-22-2:1996—Electrical relays—Part 22: Electrical disturbance tests for measuring relays and protection equipment—Section 2: Electrostatic discharge tests.

IEC 60297-5-103:2001—Mechanical structures for electronic equipment—Dimensions of mechanical structures of the 482.6 mm (19 in.) series—Part 5-103: Subracks and associated plug-in units—Electrostatic discharge protection.

IEC 60455-3-11:1988—Solventless polymerizable resinous compounds used for electrical insulation—Specification for individual materials—Epoxy resin–based coating powders.

IEC 60748-2-8:1993—Specification for harmonized system of quality assessment for electronic components—Semiconductor devices—Integrated circuits—Blank detail specification: integrated circuit static read/write memories.

IEC 60801-2:1991—Electromagnetic compatibility for industrial-process measurement and control equipment—Electrostatic discharge requirements.

IEC 61000-4-2:1995 (R2001)—Electromagnetic compatibility (EMC)—Part 4: Testing and measurement techniques—Section 2: Electrostatic discharge immunity test.

IEC 61087:1991—Guide for evaluating the discharges from a charged surface.

IEC 61340-1:1998—Electrostatics—Part 1: Guide to the principles of electrostatic phenomena (IEC/101/35/CD).

IEC/TR 61340-2-2:2000—Electrostatics—Part 2-2: Measurement methods—Measurement of chargeability.

IEC 61340-2-3:2000—Electrostatics—Part 2-3: Methods of test for determining the resistance and resistivity of solid planar materials used to avoid electrostatic charge accumulation.

IEC 61340-3-1:2002—Electrostatics—Part 3-1: Methods for simulation of electrostatic effects—Human body model (HBM)—Component testing (IEC/101/33/CD).

IEC 61340-3-2:2002—Electrostatics—Part 3-2: Methods for simulation of electrostatic effects—Machine model (MM)—Component testing (IEC/101/34/CD).

IEC 61340-4-1:1995—Electrostatics—Part 4-1: Standard test methods for specific applications—Section 1: Electrostatic behavior of floor coverings and installed floors.

IEC 61340-4-3:2001—Test method for the characterization of electrostatic protective footwear (IEC document 101/62/CD).

IEC 61340-5-1:1998—Electrostatics—Part 5-1: Protection of electronic devices from electrostatic phenomena—General requirements.

IEC/TS 61340-5-2:1999—Electrostatics—Part 5-2: Protection of electronic devices from electrostatic phenomena—User guide.

IEC/PAS 62162:2000—Field-induced charged-device model test method for electrostatic discharge withstand thresholds of microelectronic components.

IEC/PAS 62179:2000—Electrostatic discharge (ESD) sensitivity testing human body model (HBM).

IEC/PAS 62180:2000—Electrostatic discharge (ESD) sensitivity testing machine model (MM).

IEEE 120:1989 (R1997)—IEEE master test guide for electrical measurements in power circuits.

IEEE 142:1991 (R1996)—IEEE Green Book (IEEE recommended practice for grounding of industrial and commercial power systems).

IEEE 1291:1993 (R1998)—IEEE guide for partial discharge measurement in power switchgear.

IEEE 1299/C62.22.1:1996—IEEE guide for the connection of surge arresters to protect insulated shielded electric power cable systems.

IEEE 1325:1996 (R2002)—IEEE recommended practice for reporting field failure data for power circuit breakers.

IEEE C37.04:1999—IEEE standard rating structure for ac high-voltage circuit breakers.

IEEE C37.010:1999—IEEE application guide for ac high-voltage circuit breakers rated on a symmetrical current basis.

IEEE C37.011:1994—IEEE application guide for transient recovery voltage for ac high-voltage circuit breakers rated on a symmetrical current basis.

IEEE C37.012:1979 (R2000)—IEEE application guide for capacitance current switching for ac high-voltage circuit breakers rated on a symmetrical current basis.

IEEE C37.013:1997—IEEE standard for ac high-voltage generator circuit breaker rated on a symmetrical current basis.

IEEE C37.015:1993 (R2000)—IEEE application guide for shunt reactor switching.

IEEE C37.081:1981 (R1988)—IEEE guide for synthetic fault testing of ac high-voltage circuit breakers rated on a symmetrical current basis; Supplement 081a:1997 to IEEE C37.081:1981.

IEEE C37.082:1982 (R2000)—IEEE standard methods for the measurement of sound pressure levels of ac power circuit breakers.

IEEE C37.09:1999—IEEE standard test procedure for ac high-voltage circuit breakers rated on a symmetrical current basis.

IEEE C37.10:1995 (R2002)—IEEE guide for diagnostics and failure investigation of power circuit breakers.

IEEE C37.11:1997—IEEE standard requirements for electrical control for high-voltage circuit breakers rated on a symmetrical current basis.

IEEE C37.13:1990 (R1995)—IEEE standard for low-voltage ac power circuit breakers used in enclosures.

IEEE C37.14:2002—IEEE standard for low-voltage dc power circuit breakers used in enclosures.

IEEE C37.18:1979 (R1996)—IEEE standard for enclosed field discharge circuit breakers for rotating electric machinery.

IEEE C37.20.1:2002—IEEE standard for metal-enclosed low-voltage power circuit breaker switchgear.

IEEE C37.20.2:1999—IEEE standard for metal-clad and station-type cubicle switchgear.

IEEE C37.20.3:2001—IEEE standard for metal-enclosed interrupter switchgear.

IEEE C37.20.4:2001—IEEE trial-use standard for indoor ac medium-voltage switches for use in metal-enclosed switchgear.

IEEE C37.20.6:1997—IEEE standard for 4.76 to 38 kV rated grounding and testing devices used in enclosures.

IEEE C37.21:1985 (R1998)—IEEE standard for control switchboards.

IEEE C37.23:1987 (R1991)—IEEE standard for metal-enclosed bus and calculating losses in isolated-phase bus.

IEEE C62.11:1999—IEEE standard for metal-oxide surge arresters for ac power circuits (>1 kV).

IEEE C62.22:1997—IEEE guide for the application of metal-oxide surge arresters for alternating-current systems.

IEEE C62.23:1995 (R2001)—IEEE standard draft application guide for surge protection of electric generating plants.

IEEE C62.31:1987 (R1998)—IEEE standard test specifications for gas-tube surge-protective devices.

IEEE C62.32:1981 (R1998)—IEEE standard test specifications for low-voltage air gap surge protective devices (excluding valve and expulsion type devices).

IEEE C62.33:1982 (R2000)—IEEE standard test specifications for varistor surge-protective devices.

IEEE C62.34:1996 (R2001)—IEEE standard for

performance of low-voltage surge-protective devices (secondary arresters).

IEEE C62.35:1987 (R2000)—IEEE standard test specifications for avalanche junction semiconductor surge-protective devices.

IEEE C62.36:2000—IEEE standard test methods for surge protectors used in low-voltage data, communications, and signaling circuits.

IEEE C62.37:2000—IEEE standard test specification for thyristor diode surge-protective devices.

IEEE C62.38:1994 (R1999)—IEEE guide on electrostatic discharge (ESD)—ESD withstand capability evaluation methods (for electronic equipment subassemblies).

IEEE C62.41:1991 (R1995)—IEEE recommended practice on surge voltages in low-voltage ac power circuits.

IEEE C62.42:1992 (R1999)—IEEE guide for the application of gas tube and air gap arrester low-voltage (equal to or less than 1000 V rms or 1200 V dc) surge-protective devices.

IEEE C62.43:1999—IEEE guide for the application of surge protectors used in low-voltage (equal to or less than 1000 V rms or 1200 V dc) data, communications, and signaling circuits.

IEEE C62.45:2002—IEEE guide on surge testing for equipment connected to low-voltage ac power circuits.

IEEE C62.47:1992 (R1997)—IEEE guide on electrostatic discharge (ESD)—Characterization of the ESD environment.

IEEE C62.48:1995 (R2000)—IEEE guide on interactions between power system disturbances and surge-protective devices.

IEEE C62.62:2000—IEEE standard test specifications for surge-protective devices for low-voltage ac power circuits.

IEEE C62.64:1997—IEEE standard specifications for surge protectors used in low-voltage data, communications, and signaling.

IEEE C62.92.1:2000—IEEE guide for the application of neutral grounding in electrical utility systems—Part 1: Introduction.

IEEE C62.92.2:1989 (R2000)—IEEE guide for the application of neutral grounding in electrical utility systems—Part 2: Grounding of synchronous generator systems.

IEEE C62.92.3:1993 (R2000)—IEEE guide for the application of neutral grounding in electrical utility systems—Part 3: Generator auxiliary systems.

IEEE C62.92.4:1991 (R2002)—IEEE guide for the application of neutral grounding in electric utility systems—Part 4: Distribution.

IEEE C62.92.5:1992 (R2001)—IEEE guide for the application of neutral grounding in electric utility systems—Part 5: Transmission systems and subtransmission systems.

ISO/DIS 10605:2000—Road vehicles—Test methods for electrical disturbances from electrostatic discharge.

ISO/TR 10605:1994—Road vehicles—Electrical disturbances from electrostatic discharge.

JESD 22-A114-B:2000—Electrostatic discharge (ESD) sensitivity testing human body model (HBM).

JESD 22-A115-A:1997—Electrostatic discharge (ESD) sensitivity testing machine model (MM).

JESD 22-C101-A:2000—Field-induced charged-device model test method for electrostatic discharge withstand thresholds of microelectronic components.

MIL-B-81705D:1998—Barrier materials, flexible, electrostatic protective, heat sealable.

MIL-PRF-87893B:1997—Workstation—Electrostatic discharge (ESD) control.

MIL-STD-454N:1995—General requirements for electronic equipment.

MIL-STD 883E:2003—Electrostatic discharge sensitivity classification.

MIL-STD-1686C:1995—Electrostatic discharge control program for protection of electrical and electronic parts, assemblies, and equipment (excluding electrically initiated explosive devices).

NFPA 70:2002—National electric code.

QPL-87893-1:1995—Workstation electrostatic discharge (ESD) control.

RAC SOAR 6:1986—ESD control in the manufacturing environment.

SAE J551/15:2002—Vehicle electromagnetic immunity—Electrostatic discharge (ESD).

SEMI E78-0998—Electrostatic compatibility—Guide to assess and control electrostatic discharge (ESD) and electrostatic attraction (ESA) for equipment.

SEMI E043-0301—Guide for measuring charge on objects and surfaces.

Telcordia GR-1421-CORE:1995—Generic requirements for ESD-protective circuit packet containers.

UL 1449:1996 (R2002)—Transient voltage surge suppressors.

For more information on standards-related activity in the field of electrostatic discharge—as well as an introduction to static electricity and the basics of ESD—please visit the ESD Association at http://www.esda.org, or e-mail the association at info@esda.org. ■