MINIZAP®

FOR DIRECT, INDIRECT & DIAGNOSTIC ESD TESTING

Practical, Reliable Electrostatic Discharge Testing
from R & D through Test to Field Service.

Stimulates real ESD, tests to IEC 61000-4-2,
or any other major standard.

AUTHORIZED REPRESENTATIVE

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Diagnostic E-Field Testing
Contact-Mode and Air Discharge Simulation via Interchangeable, Plug-In Tips
Diagnostic H-Field Testing

Thermo KeyTek   A Thermo Electron business

By Reason, The Highest Installed User Base. Thermo KeyTek.

EMC

MINIZAP®

ESD Simulators meet the mandatory requirements for a company-wide ESD test program.

ESD is the most common cause of failure in computer based equipment. It accounts each year for hundreds of millions of dollars in downtime and repair costs.

Fortunately, catastrophic failures are preventable and many manufacturers have R&D and manufacturing programs to assure that their products are ESD-resistant when shipped. Our top of the line ESD simulators are widely used in these programs.

However, the process of installing, interconnecting and networking of computers and peripheral equipment often produces new ESD susceptibilities leading to "hard" as well as "soft" failures – i. e., lost data bits, check sum errors, hang-ups etc. These can easily result in the all-too-common "no trouble found" field service reports.

The diagnosis and remedy for these failures require additional test procedures which are developed in R&D, but implemented by QC, manufacturing and field service engineers. Our MiniZap® ESD simulators are also designed specifically for these demanding applications.

With the MiniZap, Thermo KeyTek presents what we believe to be the only family of ESD simulators with which the manufacturers of computers and other semiconductor-based equipment can implement a *meaningful, dependable, company-wide* program of ESD simulation testing with results that correlate throughout the industry.

MiniZap® with Model MZT-11 E-Field Simulation Tip.

MiniZap generates simulation pulses which are real world, repeatable and correlatable. We take pulse integrity, repeatability and correlativity to be the *mandatory* **performance criteria for equipment used in implementing a company-wide ESD test program. Imagine what would happen if they were not met:**

• If pulses were not real world, then equipment could pass the simulation test and then perish in the face of real ESD.

• If pulses were not repeatable, then one could not distinguish erratic simulator function from the apparent level of equipment susceptibility.

• And if pulses generated by field and laboratory simulators were not identical, then test protocols developed in R&D would not apply the same stress to equipment in manufacturing or the field, making all test results difficult or impossible to interpret.

Thermo KeyTek's TRUE-ESD® and other *performance by design* innovations assure that MiniZap and the entire Series 2000 meet these minimum criteria.

Only Thermo KeyTek meets the IEC 61000-4-2 standards, *and* **generates real world ESD pulses, too!**

IEC 61000-4-2 requires an ESD contact-mode current risetime lying between 0.7 and 1.0 ns, as measured on a 1 GHz (or 0.35 ns risetime) oscilloscope. However, real and reasonable worst-case ESD risetimes are less than 200 ps (which is displayed as 0.35 to 0.4 ns on the same 1 GHz scope).

By simply interchanging plug-in tips, the MiniZap allows you to meet *both* the standard's 0.7 to 1.0 ns risetime, *and* to do "reality" – generating the real, <200 ps ESD risetime, to see how well your products will *really* survive in their intended environment.

Thermo KeyTek

Test to the Standards...Test to the REALWORLD

MiniZap puts high performance in a rugged, innovative unit packaged for the manufacturing floor and the field, as well as the lab.

The MiniZap simulator is totally integrated into one light-weight unit, hand-held in operation and easily stored in any standard tool kit. Its mechanical design is a major breakthrough, and has gained total, worldwide user acceptance.

Fabricated from the finest materials including a guaranteed two million shot patented relay, MiniZap was designed to survive long term use, even in rugged industrial and field environments. We back that claim with a full year warranty.

And MiniZap is the only simulator which can be powered by either AC or *built-in* rechargeable batteries.

MiniZap is safe and easy-to-use.

MiniZap incorporates a truly innovative design (patented) which offers numerous ease-of-use- and safety features:

• The tip can **never** be "hot" when MiniZap is lying on the bench.

• An LED warns the operator when the ground cable is not plugged into the simulator.

• A digital LCD voltage display directly samples and accurately indicates the **actual tip voltage.**

• Controls are clearly labeled and their purposes are obvious.

• The simulator requires no separate HV power supply/controller or HV cables.

• The plug-in, modular Contact Mode relay and RC network may be changed in the field.

• MiniZap is powered by **built-in** rechargeable batteries or the AC adapter.

• And more.

MiniZap with Model MZT-12 H-Field Simulation Tip.

Call for ordering details.

For quantity pricing, terms and conditions, and delivery, contact our home office at 800-753-9835, or your local Thermo KeyTek representative.

System Description

All MiniZap models include the hand held MiniZap, ball and point tips, IEC ground cable, AC adapter/battery charger, set of four built-in long life rechargeable batteries, and instruction manual, all fitted into a soft carry case. One year limited warranty included.

Contact Mode and Air Discharge Testing

Plus Optional E&H Field Diagnostics

CONTACT MODE, for direct ESD tests:

• With the IEC 61000-4-2 tip, Model TPC-2A, with specified 0.7 to 1.0 ns risetime, and

• With the ANSI C63.16 "fastest" tip, Model TPC-1, with risetime measuring <0.4 ns.

AIR DISCHARGE MODE, for direct ESD tests:

• With the IEC 61000-4-2 tip, Model TPA-2 with its slowed-down risetime, and

• With a smaller, "fastest" air discharge time, Model TPA-1, for the most realistic air discharge simulation.

Interchangeable Discharge Tips for both Contact Mode and Air Discharge: permitting user-selection of tests to the updated IEC standards, or tests to the latest ANSI draft standard more closely representing the real-world ESD threat.

Plus Optional E& H Field Diagnostics

DIAGNOSTIC E-FIELD SIMULATION: to identify EUT locations sensitive to both static and dynamic E-fields, *using super-fast, real-world risetimes.* The Model MZT-11 E-Field Simulation Tip provides:

• Repeatable, local *static* E-field simulation. Used for interrogating high-impedance circuits for upsets due to various levels of fixed or slowly-changing electric fields.

• Repeatable, fast-risetime, local *dynamic* E-field simulation, while simultaneously minimizing the effects of local ESD-generated H-fields. Used for repeatably simulating the steep change in E-field associated with an ESD. The purpose is to isolate circuits sensitive to the real-world ESD E-field, which can often have sub-nanosecond edges.

   To ensure a fast E-field risetime, the Model MZT-11 E-field simulating tip is driven by the MiniZap's contact mode simulation circuits, *NOT* by a slow, air-gap discharge as in some other ESD simulators.

DIAGNOSTIC H-FIELD SIMULATION: to identify EUT locations sensitive to dynamic H-fields, *using super-fast, real-world risetimes.* The Model MZT-12 H-Field Simulation Tip provides:

• Repeatable, local dynamic H-field simulation, while simultaneously minimizing the magnitude of local ESD-generated E-fields. Analogous with dynamic E-field simulation, the purpose of diagnostic H-field simulation is to isolate circuits sensitive to real-world ESD H-fields, which often have super-fast risetimes.

   For this reason, the Model MZT-12 H-field simulating tip is driven by the MiniZap's contact mode simulation circuits, *NOT* by a slow, air-gap discharge as in some other ESD simulators.

ESD Testing without errors caused by simulator - generated multiple ESDs

   Multiple ESDs events can be generated by a human or furniture discharge because the arc extinguishes in air at an arc current of about 0.5 ampere, leaving some residual charge – and therefore

voltage – on the hand or chair. As the hand or chair continues to approach the victim equipment, however, the spacing between them becomes small enough so that even at the remaining, lower charge voltage, a new air breakdown can take place. When it does, it causes another ESD. In this way several ESDs can occur in rapid succession, starting from progressively lower charge voltages.

   This phenomenon is thus perfectly normal. HOWEVER, until now, most – if not all – other ESD simulators have *also* introduced another, *artificial* and far more energetic source of multiples. The culprit is the voltage multiplier (or "cascade") usually used to furnish the high voltage for charging the simulator capacitor. That voltage multiplier can – and usually does – function as a charge supply for the simulator capacitor *long* after the first discharge has occurred. It can therefore be responsible for generation of tens or even hundreds of multiples, often originating at very nearly the same high charge voltage as the first discharge.

   The Thermo KeyTek MiniZap does not use a voltage multiplier.

   So the MiniZap is perhaps the only ESD simulator that won't introduce testing errors and uncertainties due to streams of artificial, high-level ESD multiples.

   With MiniZap, you know the EXACT voltage you've tested at … every time.

   Thermo KeyTek uses a constant-voltage ESD simulator design, feeding back and monitoring voltage right from the tip. In this way, correct tip voltage is maintained **right** up to the instant of discharge; only **then** it is dropped, to prevent simulator-induced multiples.

   Most other simulators use the isolated-capacitor design, often giving rise to additional unrepeatability in air discharge test results. This unrepeatability results from a voltage decay which can reach 10 to 30% as a result of corona and other factors, as the simulator approaches the EUT.*

* Richman, P., Weil, G., and Boxleitner, W., "ESD Simulator Tip Voltage at the instant of Test". Proc IEEE Int'l Symposium on EMC, Washington, D.C. Aug 21-23 1990, pp 252-257.

Vertical and Horizontal Coupling Planes for Indirect ESD Testing

Plus Real, Direct and Indirect Furniture Simulation
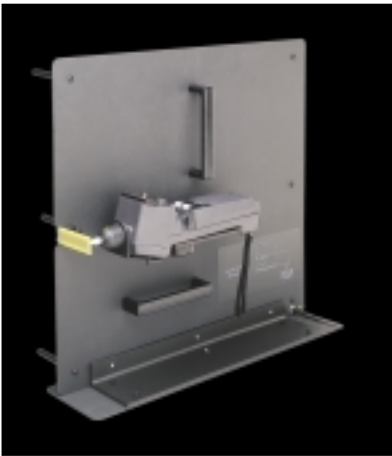
VERTICAL COUPLING PLANE (VCP): for indirect ESD tests per IEC 61000-4-2.

The VCP is used to simulate the effects of *personnel* ESDs to metal objects adjacent to an EUT. The Model VCP-1 Vertical Coupling Plane provides:

• The specified 0.5 x 0.5 m vertical coupling plane. Includes insulation at back of plane for personnel protection, plus convenient bench stand for hands-off testing, and handles to facilitate off-bench use when required.

• Exclusive rear-of-plane mounting provisions for the MiniZap, permitting ease of use of the plane-plus-MiniZap assembly when operated in hand-held as well as bench-mount mode. This mounting incorporates the IEC-specified provision for contact-mode ESD injection *from the MiniZap tip to the middle of the vertical edge of the VCP.* (The MiniZap may alternately itself be hand-held, adjacent to the VCP, with its tip touching the same mid-point on the vertical edge of the VCP.)

Contact mode testing is used to insure repeatable, fast-risetime, ESD current waveforms into the edge of the VCP.

Vertical Coupling Plane Model VCP-1, being used to test a PC. The MiniZap is positioned to inject current via IEC Contact Mode Omni-Tip™ Model TPC-2A into the center of a VCP vertical edge, per the requirements of the various standards.

HORIZONTAL COUPLING PLANE (HCP): for indirect ESD tests per IEC 61000-4-2 and ANSI standard C63.16.

The HCP is used to simulate the effects of *personnel* ESDs to a metal bench or desk on which the EUT may be resting. Because of its size and consequent shipping costs, the HCP is often procured directly by organizations doing ESD testing. The HCP-1 Horizontal Coupling Plane provides:

• The specified 1.6 x 0.8 m horizontal coupling plane. Includes a roll of <.5mm thick, static-dissipative sheet insulator for use above the plane for personnel protection. (Meets IEC 61000-4-2 insulation thickness requirements.)

• For testing to IEC 61000-4-2, the MiniZap is hand-held in a horizontal position, with its tip in contact with the edge of the HCP.

Contact mode testing is used to insure repeatable, fast-risetime, ESD current waveforms into the HCP.

MinZap – an ESD Tester that really meets IEC 61000-4-2!

The standard requires that the exact same physical simulator configuration be used for air discharge as for contact mode, with the **only** difference being that the internal contact-mode relay should be closed. The purpose is to insure that the air-discharge waveform is as close as possible to the contact-mode waveform at least at the lower voltages before corona begins to affect it. **This requirement thus specifically excludes simulators with add-ons to do contact-mode testing.**

MiniZap is built just this way – simply closing the relay to change over from contact-mode to air-discharge testing. **MiniZap is therefore unique in that it meets the exact requirements of IEC 61000-4-2 for air discharge as well as contact-mode testing.**

Series MZ/15 EC ESD Test Systems

With Digital Displays, And Upgrade Capability For Optional Addition Of Furniture ESD

MiniZap or Group

	MZEC1	MZEC2	MZEC3	MZEC4
1. AIR-DISCHARGE AND CONTACT-MODE SIMULATIONS				
• Contact-mode simulation, ±0.5 to ±8kV, and air discharge simulation ±0.5 to ±15kV; both single shot, or repetitive at 1/s and 20/s. Provides both the air discharge mode via IEC ball tip TPA-2 up to ±15kV, and contact mode with special IEC Omni-Tip™ assembly TPC-2A, up to >8kV. (Also includes True-ESD®, fastest air discharge tip, TPA-1.) The combination provides full conformance to and beyond IEC 1000-4-2 and ANSI C63.16. Uses digital display with 10V resolutions, and includes inter-locked safe, lock-on mode. Uses a 150 pF/330 ohm Discharge Network. Includes soft case, and rechargeable (internal) battery operation. Digital display indicates high voltage *measured at the tip,* to far better than the ±5% voltage accuracy required by both IEC 61000-4-2 and ANSI C63 standards **MZ-15/EC**	•	•	•	•
• True-ESD® fastest-risetime contact-mode tip **TPC-1**	•	•	•	•
• Self-discharge tip **TPF-1**	•	•	•	•
• Standoff spacer for air-discharge mode[1] **50-MZ**	•	•	•	•
2. INDIRECT ESD SIMULATION				
• Vertical Coupling Plane (VCP) 0.5m x 0.5m (19.7" x 19.7") plane, in accordance with IEC 61000-4-2 and ANSI C63.16 ESD test standards. Includes convenient bench-mount stand with mounting provisions for the MiniZap, and handles **VCP-1**		•	•	•
3. E AND H FIELD SIMULATION				
• E-Field (static **and dynamic** electric field) Simulator Tip Assembly...........................**MZT-11**			•	•
• H-Field (magnetic field) Simulator Tip Assembly...**MZT-12**			•	•
• Hard Carrying Case (does not include space for VCP-1, HCP-1, BTS-1, TP-3........................**MCA-1**			•	•
4. CALIBRATION ACCESSORIES				
• DC Output Calibration Attenuator **DCA-2**				•
• Coaxial current monitor: IEC 61000-4-2 and ANSI C63.16 coax monitor for ESD current waveform, with 1 GHz capability. *Includes high-peak-power attenuator and low loss scope cable.* IEC and ANSI require mounting the target in a 1.5m x 1.5m plane, which is not included. See TP-3 in item (7) if the Target Plane is required, or fabricate one on site. (See IEC 1000-4-2 for CTC-3 mounting dimensions.).............................**CTC-3**				•
• Field and Corona Sensor Group: including Common Monitor Unit HEC-1, H-Field sensor HFS-1, E-field sensor EFS-1 and Pre-Discharge corona sensor CCS-1 ....**FCS-1**				•

5. ADDITIONAL OPTIONS

These options are not included in any MZ-15/EC Model Groups. Instead, they are available at special prices when purchased along with any MZ-15/EC Model Group. Note that shipping expenses for either large plane may be quite high, simply because of its size.

- A. Full, 1.5m x 1.5m (59" x 59") IEC-801-2 or 1000-4-2, and ANSI C63.16 Target Plane, for mounting the CTC-3 coaxial target..**TP-3**
- B. Horizontal Coupling Plane (HCP), 0.8m x 1.6m (31.5" x 63") for use on non-conducting tabletop under a small EUT, as per IEC 61000-4-2, and ANSI C63.16. Includes one roll of <0.5mm thick, static-dissipative sheet insulator...**HCP-1**

• MZEC1 includes fastest, real-world contact-mode and air discharge tip, standoff spacer.
• MZEC2 adds Vertical Coupling Plane.
• MZEC3 adds diagnostic fields.
• MZEC4 adds calibrators.

SPECIFICATIONS, Model MZ/15 EC and Calibration Accessories

MINIZAP MODE MZ-15/EC

|	
Voltage Range	±0.5 to >8 kV, Contact Mode; ±0.5 to 15 kV, Air Discharge
Air Discharge	TRUE-ESD® (<0.3 ns nominal risetime up to 4 kV)
Contact Mode[1,2]	FR/CI™ std <0.3 ns risetime independent of charge voltage; 3.75A/kV ± 10% peak, e.g. 30 A @ 8 kV
RC Networks[3]	150 pF/330 ohm std
Lock On	Std (with safety interlock)
Rep Rate	Single shot as well as 1/sec and 20/sec repetitive operation
HV Display	Digital LCD display measures actual HV at the tip with 10V resolution, ~3% accuracy
Ground Connect Warning	LED indicates ground cable not connected to MiniZap
Power	Operates either from 120 VAC, 50/60 Hz or 4 NiCd batteries with LED charge status indicator. (220/240 VAC, 50/60 Hz and European plugs optional)
MiniZap Size	10" x 2.5" x 3.2" (25.4cm x 8.9cm x 8.1cm)
MiniZap Weight	29 oz (822 gm) nominal, plus case and accessories

CALIBRATORS

DCA-2	**DC Output Calibration Attenuator:** network to allow oscilloscope or meter monitoring of DC stored on the discharge capacitor (10,000:1 ratio).
CTC-3	**Coaxial Current Monitor:** IEC 61000-4-2, and ANSI C63.16 coax monitor for ESD current waveform, with >1 GHz capability. Includes high-peak-power attenuator and scope cable.

Notes:

(1) Fast Rise Current Injection, FR/CI™ is relay actuated per the 1991 revision of IEC 801.2. (Two million shot warranty on replaceable relay module in the MZ-15/EC.)

(2) The MZ-15/EC also includes the TPC-2A OMNI-TIP™ specifically to meet the requirements of the revised IEC 801-2 test standard (namely 0.7 to 1.0 ns risetime, and 3.75 A/kV peak current).

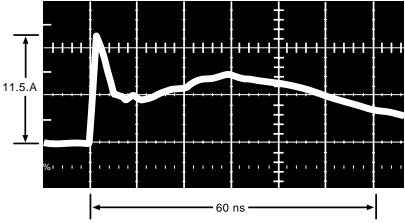(3) Consult factory for other RC network and standards requirements.

Human (Hand/Metal) Discharge Wave:*

Output Current Waveform per IEC 61000. ANSI C63.16 waveform available by simply interchanging plug-in tips.

Typical Output Current (3kV) from MiniZap
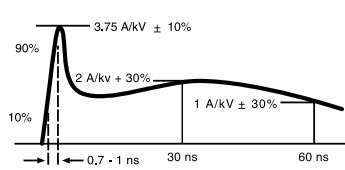
*Specified only for direct contact discharge (1GHz scope). Same circuit is used for air discharge, with no wave spec.

Specifications subject to change without notice.