

SILENT PROTECTORS MONITORING CRITICAL ISOLATION IN MEDICAL AND ENERGY SYSTEMS

Using Standex Reed Relays for Safety and Reliability





High-Voltage Systems Demand Reliable Insulation Measurement

In a world increasingly powered by high-voltage systems, ensuring safe and efficient operation is paramount. Whether it's advanced medical applications or critical energy storage systems, the need for precise and dependable insulation measurement is more critical than ever. Among the various components used for this purpose,



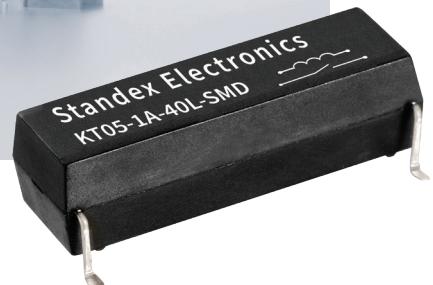
Check out the full list of Standex's testing and certifications:

- AS9100, ISO9001, IATF16949 Certified
- ITAR & NIST Compliant
- AEC-Q200 Qualified
- ISO 6469-3
- IEC 62109-1/2
- IEC 60664-1
- IEC 60601-1
- UL Recognized

reed relays stand out as a technology offering a compelling combination of functionality, longevity, and reliability.

High-voltage systems, such as those found in medical devices and energy storage systems, necessitate robust insulation between different electrical networks to prevent electric shock and system malfunctions. In medical applications, preventing electric shock to vulnerable patients connected to devices is crucial. Similarly, in energy storage systems, the high-voltage battery must be perfectly and safely separated

from other components. Regular insulation measurement is essential to monitor the dielectric strength between high-voltage circuits and other parts of the system, such as low-voltage control circuits. This monitoring is required after production and throughout the system's lifespan to detect any deterioration in isolation that could lead to hazardous situations. Standards often dictate that the isolation voltage must be significantly higher (e.g., 3-4 times) than the operating voltage to ensure safety.





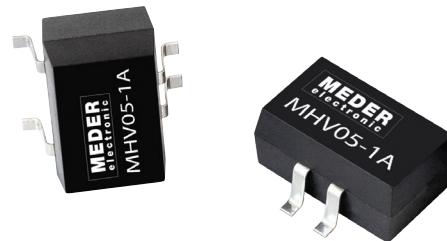
Why Reed Relays Excel in Insulation Measurement

While various components can be used for isolation measurement, reed relays are exceptionally well-suited for this critical task. Their inherent design and properties offer several key advantages:

- 1. High breakdown voltage:** Withstanding up to 6 kV DC, these compact size KT relays will handle systems with a significant factor of safety. This capability ensures the system's reliable operation even with transient voltage spikes common in high-voltage electrical systems. The safety factor, typically 1.5 to 2 times the maximum expected voltage, provides a crucial buffer against unexpected surges.
- 2. Excellent isolation:** A coil-to-contact isolation voltage of 7 kV DC for the KT series protects control and power circuits. This high isolation maintains the integrity of sensitive electronic systems, creating a robust barrier between low-voltage control signals and high-voltage power circuits.

Some high-voltage reed relays for medical applications such as the HM series can even achieve dielectric strength up to 20 kV.

- 3. Low leakage current:** Insulation resistance exceeding 10^{13} ohms minimizes unwanted current flow between isolated circuits, which is crucial for the system reliability and accuracy. This high resistance ensures negligible power loss due to leakage, enhancing system efficiency and safety.
- 4. Compact, rugged design:** Available in through-hole and surface mount options, these relays feature a thermoset over-molded package for durability. The design allows for high-density circuit board placement while protecting against vibration, dust, and moisture.



Applications in Diverse Fields

The advantages of reed relays make them a preferred choice for insulation measurement across various high-voltage applications:

Medical Devices: In advanced medical applications, reliable electric isolation is crucial for patient and healthcare worker safety and for ensuring accurate measurements. High-voltage reed relays are used in devices like Pulsed Field Ablation (PFA) systems, Intravascular Lithotripsy (IVL) devices, Electrophysiology & Cardiac Ablation Systems, Surgical Generators, Automatic External Defibrillators (AEDs), and Defibrillator Testers. They ensure the precise delivery of energy, prevent leakage, and maintain safety in high-voltage procedures.

Energy Storage Systems (ESS): Similar to EVs, energy storage systems rely on high-voltage batteries and require continuous monitoring of insulation to prevent hazards. Nowadays, the most common voltage level of the ESS systems is up to 1500V, the future trends indicates an increase up to 2500V.

With the increasing voltage level, the safety becomes even more important. Reed relays are used in the Battery Management Systems of energy storage solutions to isolate high-voltage and low-voltage circuits for periodic insulation resistance measurements. In transformer-less high-voltage inverters used in ESS for solar energy, reed relays can act as a bridge to carry the test current for insulation monitoring before or after grid connection.

Meeting the Requirements

- Creepage distance
- Frequency
- Current
- Voltage
- Isolation



Advantages Over Competing Technologies

Reed technology has several distinct advantages over alternative switching technologies:

- 1. Speed:** Achieve faster operation than traditional electromechanical relays, typically under 1 - 3 milliseconds. This rapid switching is indispensable for responsive system control and protection, particularly in overcurrent protection or system fault isolation.
- 2. Longevity:** With a life expectancy of millions of operations, these reed relays outlast many competing technologies, ensuring reliable operation throughout the systems lifetime. This longevity is crucial in medical and energy storage systems, where downtime can lead to significant consequences. In medical systems, reliable operation is essential to ensure patient

safety and continuous care. Similarly, in energy storage systems, uninterrupted performance is vital to maintain power supply and prevent economic losses.

- 3. No wetting current:** Unlike some electromechanical alternatives, reed relays don't require a minimum current to maintain conductivity, making them ideal for a low-power sensing and control applications. This allows for a more flexible system design and can improve overall energy efficiency.
- 4. Inherent isolation:** The hermetically sealed reed switch provides natural galvanic isolation between control and switched circuits, enhancing safety and reducing electromagnetic interference. This isolation is paramount in high-voltage systems to protect sensitive control electronics.



Powering the Future of High-Voltage Technology

The growing use of high-voltage systems in transportation, healthcare, and energy demands reliable insulation measurement. Reed relays provide an ideal solution with their high isolation capabilities, minimal leakage current, fast switching, environmental robustness, and compliance with safety standards. Their proven

performance in electric vehicles, medical devices, and energy storage systems makes them essential for ensuring the safety and efficiency of high-voltage systems. The trend towards smaller, more power-efficient reed relays further highlights their importance in the future of high-voltage technology.

Standex's Commitment to Innovation

We are developing higher-power reed relays to meet evolving alternative energy and medical market demands. These new relays will offer greater voltage and current handling capabilities, paving the way for next-generation electronic equipment.

Standex is committed to advancing high-voltage switching and control technology.

Ensuring that as your high-voltage technology evolves, Standex will be ready with cutting-edge solutions to meet new challenges.

To learn more about how Standex Electronics can support your innovative electric vehicle projects with custom magnetics and sensor solutions, visit standexdetect.com or contact our engineering team to discuss your specific application needs.



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