

White Paper

Lighting and industrial automation: Boosting reliability and performance under most demanding conditions

Abstract

Cables play a critical role in the industrial automation and lighting industries by enabling the transmission of both power and data throughout systems. They are fundamental in ensuring reliable data and electricity supply from the source to the single units, essential for maintaining consistent performance. Moreover, cables enable the integration of advanced control systems, supporting the implementation of smart solutions that can be remotely managed and monitored. In practical applications, cables connect various components within systems, including drivers, sensors, and light sources,

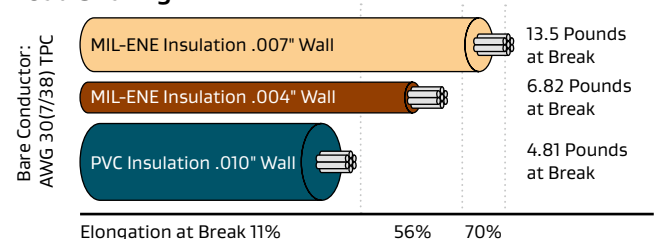
enabling seamless operation and control. Their high-quality construction minimizes energy loss, thereby enhancing overall system efficiency. Importantly, cables contribute to safety by preventing electrical faults that could lead to hazards such as short circuits or fires. Designed to withstand diverse environmental conditions, GORE® Cables in the industrial automation and lighting industry are engineered for durability and longevity. They are instrumental in distributing power and data across expansive areas, serving crucial roles in various applications.

Meeting stringent requirements

MIL-ENE, developed by W. L. Gore & Associates, is an advanced material designed to meet the stringent requirements of various industries, including industrial automation, and lighting. Extensively used as an insulation and jacket material for cables within these sectors, MIL-ENE ensures reliability and performance under the most demanding conditions. This insulation is an extremely tough, thin polyester laminate, allowing for significantly smaller cables due to its thin primary insulation. The reduction in cable size enhances flexibility because the bending ease of a bundle of wires is inversely proportional to the fourth power of the cable's radius.

Figure 1 illustrates the comparison in wall thickness, load sharing, and cut-through protection, demonstrating the unrivalled performance of MIL-ENE compared to other materials such as PVC or TEFZEL™.

Load Sharing



Cut-Through Protection

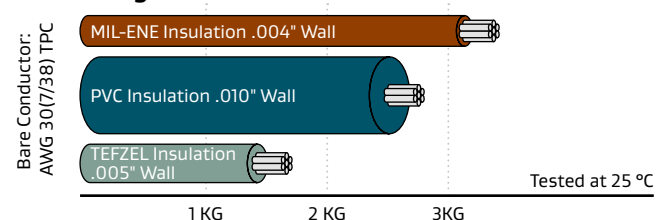


Fig. 1: Comparison in Wall-thickness, Load Sharing & Cut-Through Protection

The exceptional thinness of MIL-ENE insulation allows for the size reduction of component wires; for instance, a 0.004-inch wall of MIL-ENE dielectric can replace 0.010 to 0.020 inch of common insulations while maintaining the same voltage rating. A 50 percent smaller cable is approximately 94 percent more flexible. Additionally, MIL-ENE provides superior cut-through protection compared to other flexible insulations, enabling the use of smaller gauge conductors in applications where larger conductors were previously required solely for mechanical strength. The high-modulus insulation uniquely shares loads, thereby increasing the conductor's overall strength. Engineered for durability and abrasion resistance, MIL-ENE is ideal for intensive use in challenging conditions. It performs effectively across a wide temperature range (–30 °C to +120 °C), making it adaptable to diverse climates. Despite its robustness, MIL-ENE is lightweight, reducing application fatigue, and UV-resistant, extending the lifespan of exposed products. Engineered for an extended service life, it provides cost-effective solutions with robust protection against chemical, biological, and environmental threats, as well as being flame retardant. These attributes make MIL-ENE an exceptional choice for cables in industrial automation and lighting, as well as other demanding applications.

Customer preferences and market dynamics in an evolving regulatory landscape may suggest exploring cables made without per- and polyfluorinated chemicals (PFAS). As materials science experts W. L. Gore & Associates have the expertise and material knowledge to effectively develop constructions without intentionally added PFAS. They are proficient in innovating solutions that meet the performance requirements of the industrial automation and lighting industries while complying with environmental standards and regulatory requirements. This also strengthens supply chain resilience.

MIL-ENE is also applied in this context. It does not contain intentionally added PFAS and meets all REACH and ROHS requirements. Industry-standard Fluorinated

Ethylene Propylene (FEP) insulated cables, can easily and effectively be replaced with cables insulated with MIL-ENE material. Figure 2 illustrates an example of a double-insulated cable featuring MIL-ENE material. Compared to conventional Fluorinated Ethylene Propylene cables, this cable is approximately two-third lighter and more than 40% smaller in diameter, offering significantly superior performance in both size and bending radius.

As demonstrated by this example, Gore's unique process and product expertise enable the treatment of various materials to enhance their beneficial properties. This ensures that the final product not only meets but also exceeds the specific requirements of customers and their respective industries. Ultimately, this is what our products promise and why they are known and valued.

Construction:

Pos. 1	Conductor	Bare Copper AWG 22 (01)
Pos. 2	Insulation	Halogen free MIL-ENE
Pos. 3	Binder	Polyester
Pos. 4	Jacket	Halogen free MIL-ENE

Characteristics:

Operating voltage	600 V rms
Operating temperature range	–30 °C to +120 °C

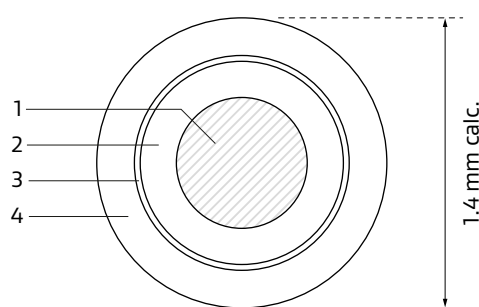


Figure 2: MIL-ENE – Double Insulation Cable

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