

# KITCHEN ARMOR®

## POWER OVER ETHERNET BEST PRACTICES

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### What is Power over Ethernet (POE) and why is it important?

Power over Ethernet (POE) is a technology that allows both electrical power and data to be transmitted over a single twisted pair cable, typically an Ethernet cable. This integration simplifies the installation and operation of networked devices by eliminating the need for separate power supplies and outlets.

#### **Benefits of leveraging Power over Ethernet (POE):**

- ✍ **Simplified Infrastructure:** POE reduces the complexity of network installations by combining power and data delivery. This leads to fewer cables, reduced clutter, and easier management of network infrastructure.
- ✍ **Cost-Efficiency:** By using existing Ethernet infrastructure to deliver power, POE eliminates the need for additional electrical wiring and power outlets, resulting in significant cost savings in both materials and labor.
- ✍ **Flexibility and Scalability:** POE-enabled devices can be installed in locations without easy access to power outlets, such as ceilings, walls, or under kitchen hoods.
- ✍ **Enhanced Safety:** POE technology adheres to rigorous safety standards, providing protection against power surges and short circuits. This ensures the safety of both devices and personnel.
- ✍ **Reliability:** Centralized power management allows for seamless integration with uninterruptible power supplies (UPS), ensuring that critical devices remain operational during power outages.
- ✍ **Smart Power Management:** Advanced POE standards, such as POE+ and POE++, offer intelligent power allocation, allowing for efficient distribution of power based on device requirements. This is particularly useful for managing energy consumption in large networks.

#### **Power over Ethernet (POE) Applied Use-Cases:**

Power over Ethernet (POE) is not a novel technology, yet its applications continue to evolve, extending to powering a variety of devices that might not be immediately apparent. Common uses for POE include:

- ✍ **Stand Alone Touch Screens:** Kitchen Armor POE All-in-One Devices and similar products can be powered and connected to the network with one single cable
- ✍ **IP Cameras:** Providing both power and data connectivity, POE simplifies the installation of surveillance systems, particularly in locations where traditional power outlets are not readily available.

- ✖ **Wireless Access Points:** Enabling the deployment of Wi-Fi networks in optimal positions without the need for separate electrical wiring, enhancing network coverage and performance.
- ✖ **VoIP Phones:** Allowing for the seamless integration of voice communication systems by delivering power and data over a single cable, reducing the complexity of office setups.
- ✖ **Network Switches:** Supporting the addition of PoE-enabled switches that can power multiple devices from a single location, centralizing power management and simplifying network infrastructure.
- ✖ **Digital Signage:** Powering digital display panels used for advertising and information dissemination in public spaces, streamlining installation and reducing operational costs.
- ✖ **IoT Devices:** Facilitating the deployment of Internet of Things (IoT) devices such as sensors and smart lighting systems, which benefit from the unified delivery of power and data.

## Power over Ethernet (POE) Deployment and Best Practices:

While there is extensive literature on the various types of Power over Ethernet (POE), there is relatively little guidance on the optimal installation methods for physical cables to avoid performance issues.

### **Cable Selection in Power over Ethernet (POE)**

Selecting the appropriate cabling is essential in Power over Ethernet (POE) low voltage setups to ensure optimal performance, reliability, and safety of the network. Here are the key reasons why cable selection is crucial, along with specific cable types to illustrate each point:

#### 1. **Performance and Data Integrity:**

- ✖ **Bandwidth and Speed:** Higher category cables (such as Cat5e/Cat6 and above) offer greater bandwidth and support higher data transfer speeds, essential for modern network demands.
- ✖ **Signal Quality:** Shielded cables like Cat6a STP (Shielded Twisted Pair) reduce electromagnetic interference (EMI) and crosstalk, preserving the integrity of data signals over longer distances. This shielding is mandatory if running Cable bundles around LED lighting, power conduits, or other electronic infrastructure.
- ✖ **Keystone Jacks:** Use Cat5e or Cat6 Ethernet keystone jacks with gold plating to prevent corrosion and maintain optimal conductivity.
- ✖ **Patch Cables:** Select good-quality Cat5e or Cat6 patch cables and limit their length to under 15 feet to ensure efficient data and power transmission.

#### 2. **Power Delivery:**

- ✖ **Current Capacity:** Different cable categories have varying capacities to carry current. Higher category cables (such as Cat5e/Cat6 and above) can handle greater power loads without overheating, ensuring efficient power delivery to connected devices.
- ✖ **Voltage Drop:** The resistance of the cable affects the voltage drop over distance. Selecting a cable with lower resistance minimizes voltage drop, ensuring that devices receive adequate power.

### 3. Heat Management:

- ✖ **Thermal Performance:** As power requirements increase, the potential for heat generation within the cable also rises. Cables like Cat6a F/UTP (Foiled/Unshielded Twisted Pair) with better thermal performance prevent excessive heat buildup, which can degrade performance and potentially damage the cable and connected devices.
- ✖ **Bundling Practices:** When cables are bundled together, heat dissipation becomes more challenging. Choosing cables with higher temperature ratings and proper installation techniques helps manage and mitigate this issue.

### 4. Compliance and Safety:

- ✖ **Industry Standards:** Adhering to industry standards (such as IEEE 802.3af/at/bt) ensures that the selected cables meet the necessary specifications for POE applications. Cables like Cat5e, Cat6a, and Cat7 are designed to meet these standards, guaranteeing compatibility and safety.
- ✖ **American Wire Gauge (AWG):** The American Wire Gauge (AWG) standard is a system used to measure the diameter, or gauge, of electrical wires, widely used in North America for both solid and stranded wires. Lower AWG wires, such as 23 AWG or 24 AWG, are recommended for use with POE to balance flexibility and performance.
- ✖ **Fire Safety:** Cables with appropriate fire ratings, such as Cat5e Plenum (CMP), Cat6a Plenum, or Cat7 Plenum, are essential for installations in specific environments to meet building codes and regulations, ensuring the safety of the installation.

### 5. Future-Proofing:

- ✖ **Scalability:** Investing in higher category cables, such as Cat6a, Cat7, or Cat8, supports future network upgrades, accommodating higher power levels and data rates as technology evolves.
- ✖ **Longevity:** High-quality cables, such as Cat5e, Cat6a, or Cat7, are more durable and reliable, reducing the need for frequent replacements and minimizing long-term maintenance costs.

In summary, careful cable selection in POE low voltage setups is vital for ensuring the efficient, safe, and reliable operation of the network. By choosing the right cables, such as Cat5e, Cat6, Cat6a, Cat7, and Cat8, you can optimize performance, manage heat effectively, comply with safety standards, and future-proof your infrastructure for evolving technological demands.

## Cable Bundling; Best Practices

Ethernet cable bundles carrying POE that are put inside conduit are even more limited as to cable count, so avoid conduit if you can but there are guidelines found below if you intend to use it. POE power can generate heat, so provide space for the cables to expel heat is important. Do not bundle cables too tight.

## Best Practices for POE Cable Selection and Installation

### Do:

- ✘ Opt for Higher Category Cables: Whenever feasible, choose higher category cables (e.g., Cat5e or Cat6) which typically have thicker copper conductors. For POE applications, 23 AWG Cat5e is preferable.
- ✘ Use High-Quality Keystone Jacks: Ensure the use of high-quality punch down or keystone jacks for reliable connections.
- ✘ Select Shielded Patch Cables: Use 24 AWG shielded patch cables with strain relief to maintain performance and durability.
- ✘ Choose F/UTP Shielded Ethernet Cables: When dealing with large numbers or very high wattage POE runs, especially if bundled, opt for F/UTP (shielded) Ethernet cables to reduce interference and improve heat dissipation.
- ✘ Bundle Cables with Velcro Straps: If bundling cables is necessary, use Velcro straps instead of zip ties to avoid damage and ensure better heat dissipation.
- ✘ Power Down POE Ports: Always power down POE ports before plugging or unplugging end equipment or working on the cable to prevent damage and ensure safety.

### Avoid:

- ✘ Avoid CCA Cables: Never use copper clad aluminum (CCA) Ethernet cables as they are not suitable for POE applications.
- ✘ Do Not Use Zip Ties: Avoid using zip ties to secure Ethernet cables, as they can cause damage over time and degrade performance due to restricted heat dissipation.
- ✘ Avoid Thin Stranded Cables: Do not use 26 AWG or 28 AWG stranded copper Ethernet cables, as they are inadequate for POE applications.
- ✘ Follow Manufacturer-Specific Advice: For proprietary POE applications, defer to the manufacturer's specific advice for cable installation. This document assumes the use of industry-standard IEEE 802.3 POE.
- ✘ Avoid Repeated Plugging and Unplugging: Do not repeatedly plug or unplug RJ45 8P8C connectors or field termination plugs from female mating interfaces while POE circuits are energized, as this can cause damage and degrade performance over time.
- ✘ By adhering to these best practices, you can ensure a reliable and efficient POE installation that maintains high performance and longevity.