Siemon Advantages using Shielded Cabling Systems to Power Remote Network Devices

Remote powering applications utilize the copper balanced twisted-pair IT cabling infrastructure to deliver dc power to IP-enabled devices. The popularity of this technology and the interest in expanding its capabilities is staggering.

- Over 100 million PoE enabled ports are shipping annually.
- Cisco® 60W Universal PoE (UPOE) technology is driving virtual desktops.
- POH technology can deliver up to 100W in television and display applications.
- The IEEE 802.3bt DTE Power via MDI over 4-Pair Task Force is developing a 4-pair PoE application.

In less than a decade, remote powering technology has revolutionized the look and feel of the IT world. Many IT managers aren't aware that remote power delivery produces temperature rise in cable bundles and electrical arcing damage to connector contacts. Heat rise within bundles has the potential to cause higher bit errors because insertion loss is directly proportionate to temperature. In extreme environments, temperature rise and contact arcing can cause irreversible damage to cable and connectors. Fortunately, the proper selection of network cabling can completely eliminate these risks.

Siemon shielded category 6A and category 7A cabling systems provide the following advantages that ensure a "future-proof" cabling infrastructure capable of supporting remote powering technology for a wide range of topologies and operating environments:

ELECTRICAL ARC CREATED DURING UNMATING CAN DAMAGE PLUG/JACK CONTACT INTERFACE

Telecommunications modular plug and jack contacts are carefully engineered and plated (typically with gold or palladium) to ensure a reliable, low resistance mating surface. Today's remote powering applications offer some protection to these critical connection points by ensuring that dc power is not applied over the structured cabling plant until a remotely powered device (PD) is sensed by the power sourcing equipment (PSE). Unfortunately, unless the PD is shut off beforehand, the PSE will not discontinue power delivery if the modular plug-jack connection is disengaged. This condition, commonly referred to as, "unmating under load", produces an arc as the applied current transitions from flowing through conductive metal to air before becoming an open circuit. While the current level associated with this arc poses no risk to humans, arcing creates an electrical breakdown of gases in the surrounding environment that results in corrosion and pitting damage on the plated contact surface at the arcing location.

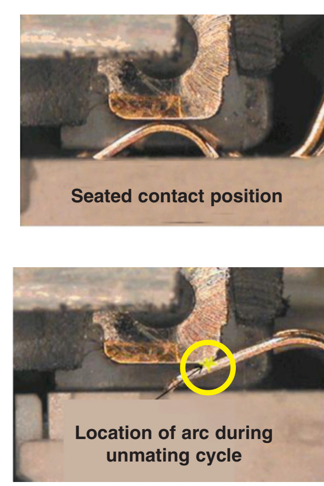

Figure 1: Arc location in "wipe" area occurs outside of final seated contact position

While it's important to remember that arcing and subsequent contact surface damage is unavoidable under certain mating and unmating conditions - contacts can be designed in such as way as to ensure that arcing will occur in the initial contact "wipe" area and not affect mating integrity in the final seated contact position. Siemon contact design ensures a "make first, break last" connection so any potential damage due to arcing will occur well away from the final contact mating position.

- Siemon's Z-MAX® and TERA® connecting hardware has been independently certified to comply with IEC 60512-99-001, which ensures that critical contact seating surfaces are not damaged from the arc that occurs when plugs and jacks are unmated under remote powering current loads.

HIGH TEMPERATURES CAN CAUSE PREMATURE AGING AND CABLE DEGRADATION

The standard ISO/IEC operating environment for structured cabling is -20°C to 60°C (-4°F to 140°F). Compliance to industry standards ensures reliable long term mechanical operation of cables and connectors in environments within these temperature limits. Exceeding the specified operating range can result in degradation of the jacket materials and loss of mechanical integrity that may have an irreversible effect on transmission performance that is not covered by a manufacturer's product warranty. Since deployment of certain remote powering applications can result in a temperature rise of up to 10°C (50°F) within bundled cables (refer to Table A.1 in TIA TSB-184 and Table 1 in ISO/IEC TR 29125), the typical rule of thumb is to not install minimally compliant cables in environments above 50°C (122°F).

This restriction can be problematic in regions such as the American southwest, the Middle East, or Australia's Northern Territory, where temperatures in enclosed ceiling, plenum, and riser shaft spaces can easily exceed 50°C (122°F). To overcome this obstacle, Siemon shielded category 6A and 7A cables that are qualified for mechanical reliability up to 75°C (167°F).

- Siemon's Z-MAX shielded category 6A and TERA category 7A cabling are qualified for mechanical reliability up to 75°C (167°F) and can support the IEEE 802.3 Type 2 PoE Plus application over the entire ISO/IEC operating temperature range of -20°C to 60°C (-4°F to 140°F) plus an additional 10°C temperature rise from heat build-up inside cable bundles due to remote power delivery.

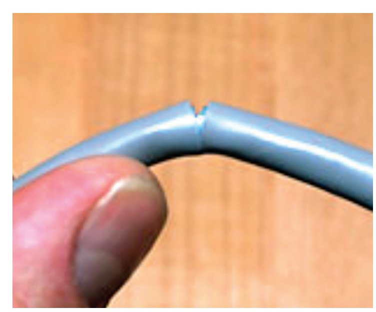

Figure 2: Cable exposed to high temperatures over time can become brittle and subject to splitting.

INSERTION LOSS INCREASES WITH HIGHER TEMPERATURES REQUIRING LENGTH DE-RATING

Awareness of the amount of heat build-up inside the cable bundle due to remote power delivery is important because cable insertion loss increases (signals attenuate more) in proportion to temperature. The performance requirements specified in all industry standards are based on an operating temperature of 20°C. The temperature dependence of cables is recognized in cabling standards and both TIA and ISO specify an insertion loss de-rating factor for use in determining the maximum channel length at temperatures above 20°C (68°F). The temperature dependence is different for unshielded and shielded cables and the de-rating coefficient for UTP cable is actually three times greater than shielded cable above 40°C (104°F) (refer to Annex G in ANSI/TIA-568-C.2 and Table 21 in ISO/IEC 11801, 2nd edition). For example, at 60°C (140°F), the standard-specified length reduction for category 6A UTP horizontal cables is 18 meters. In this case, the maximum permanent link length must be reduced from 90 meters to 72 meters to offset increased insertion loss due to temperature. For minimally compliant category 6A F/UTP horizontal cables, the length reduction is 7 meters at 60°C (140°F), which means reducing maximum link length from 90 meters to 83 meters.

The key takeaway is that shielded cabling systems have more stable transmission performance at elevated temperatures and are best suited to support remote powering applications and installation in hot environments.

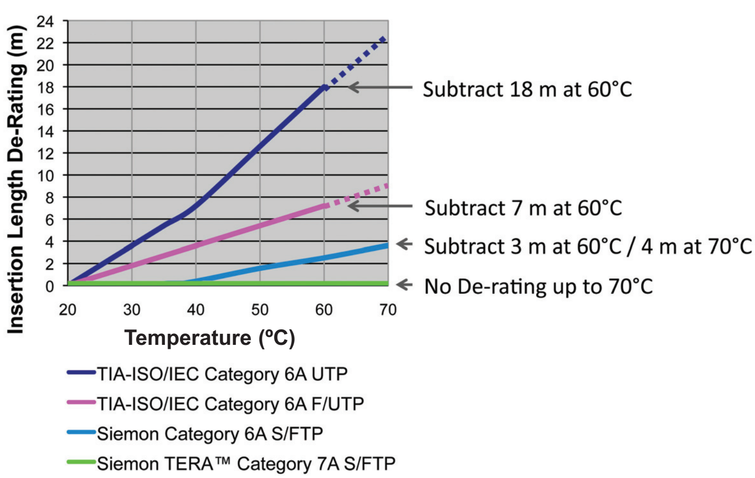

Figure 3: Horizontal cable length de-rating versus temperature for application speeds up to 10GBASE-T

- Siemon's category 6A and 7A shielded cables exhibit extremely stable transmission performance at elevated temperatures and require less length reduction to satisfy insertion loss requirements; thus, providing the cabling designer with significantly more flexibility to reach the largest number of work areas and devices in "converged" building environments.

- Siemon's Z-MAX shielded category 6A cabling solutions require less than one-fifth the length de-rating than minimally compliant category 6A UTP cables at 60 (140°F).

- As shown in figure 3, the length reduction for Siemon 6A F/UTP horizontal cable at 60°C (140°F) is 3 meters, which means reducing maximum link length from 90 meters to 87 meters. After adding the potential 10°C temperature rise due to Type 2 PoE for a total of 70°C (150°F) then the length derating is 4 meters for a total link length of 86 meters.

- Due to their superior and stable insertion loss performance, Siemon's fully-shielded category 7A cables do not require any length de-rating to support Type 2 PoE applications up to and including 10GBASE-T over a full 4-connector, 100-meter channel topology in environments up to 70°C (150°F).

CONCLUSION:

The advent of remote powering technology has significantly increased the number of networked devices, with surveillance cameras, IP phones, and wireless access points driving the market for PoE chip-sets today.

As the PD market matures, new and emerging remote powering technology continues to evolve to support advanced applications, improved efficiency, and increased power delivery. Power over HDBaseT, UPOE, and the work of the IEEE 802.3 4-Pair Power over Ethernet Study Group formed to investigate more efficient power injection schemes are enabling remote powering applications that will support new families of devices, such as lighting fixtures, high definition displays, digital signage, and point-of-sale (POS) devices that can consume more than 30W of power. All trends indicate that four pair power delivery is the future of remote powering technology. Siemon connectors and cables are specifically designed to handle remote powering current loads, associated heat build-up, and contact arcing to minimize the risk of component damage and transmission errors.

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