



EDITION 25

VOLUME 1

# 20 REASONS WHY SOUTHWIRE'S CLASS™ CLASS 4 CABLE WILL ENABLE DIGITAL POWER

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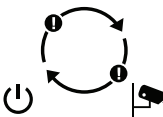
## SUSTAINABLE DIGITAL POWER

The transformational development of digital power allows high power AC or DC electricity to be transmitted safer and simpler than traditional methods. Southwire has been a top leader in the electrical wiring supply chain in North America for over 70 years. Our explosive growth has been achieved by launching innovative products, delivering value-added solutions, and investing in disruptive technology start-ups. This whitepaper explains why Southwire's CL4SS™ Class 4 cable products will further enable the transition to sustainable digital power.



## NEW CLASSIFICATION, 4 DECADES LATER

The NFPA 70® National Electrical Code® (NEC®) is revised every 3 years by a total of 18 code-making panels. The 2023 edition has introduced the Class 4 (CL4) power designation in the newly published Article 726. Class 3 was added in 1978, making this the first new power classification in over four decades. Class 4 circuits, also known as Fault-Managed Power (FMP), are revolutionary because of their ability to carry higher power over longer distance safely, efficiently, and economically using the same low-voltage wiring practices as class 2 circuits..



## FAULT-MANAGED POWER

Fault-managed power systems (FMP or FMPS) can power many low-voltage applications from a source using a Class 4 transmitter (TX) and a Class 4 receiver (RX) through a Class 4 cable (CL4). FMP can monitor the circuit to quickly cut off power during a fault event. Class 4 differs from Class 1, Class 2, and Class 3 systems in that they are current limited for faults but can still provide high power to loads during normal operation.



## 7.5 TIMES HIGHER VOLTAGE

Power over Ethernet (PoE) is a Class 2 circuit with a maximum voltage of 60V DC. Class 4 can be supplied with a much higher-voltage power source from the transmitter of up to 450V peak AC or DC. Therefore, Class 4 can deliver 7.5 times greater voltage compared to Class 2. For the same size conductor, a much higher power can be delivered via Class 4. Any faults on a Class 4 circuit are mitigated almost instantly, preventing electric shocks or fire.



## DETECT POTENTIAL FAULTS

Many potential fault events could trigger the Class 4 transmitter to interrupt power. These include short circuit, line-to-line fault, ground-fault, overcurrent, malfunction of monitoring or control devices, and parallel & series arcing that present an unacceptable safety risk. Any faults on a Class 4 circuit are mitigated almost instantly, preventing electric shock and eliminating fire hazard. Many devices such as circuit breakers, overcurrent protections, and GFCI (Ground-Fault Circuit-Interrupter) or AFCI (Arc-Fault Circuit-Interrupter) can be eliminated, which contributes to space and cost savings.

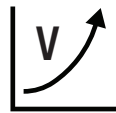


## FIRST METHOD FOR FAULT MANAGEMENT

Digital Electricity™ technology, patented by Voltserver, Inc., pioneered the use of FMP circuits in the marketplace. This FMP solution deploys a Pulsed Power or Packet Energy Transfer (PET) design. It works by transmitting a high-frequency pulsed-current waveform through a Class 4 cable, which limits the fault energy by dividing DC power into small packets. When a fault is detected, the system can quickly cut off power with very little fault current. Once the fault is cleared, the system can transmit power again automatically without a manual reset. **Scan the QR code** to learn more.



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## HIGH POWER, LIMITED FAULT CURRENT

Class 4 systems can deliver tens of kilowatts of high power, which is orders of magnitude greater than Class 2 circuits. Class 4 systems are not power limited but are fault-current limited between the transmitter and the receiver. The fault current limit depends on its duration. For example, the maximum peak AC fault current is 1,122 milliamp (mA) at 1-millisecond (ms) duration, while a longer fault of 10 ms would only be allowed 424 mA per UL 1400-1. By limiting the fault current to below the human body safety threshold, Class 4 circuits are touch-safe. Similarly, Class 4 circuits control fault energy to limit fire ignition risk, detecting and stopping the fault almost immediately beyond what a standard AC circuit breaker can do.





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## NO CONDUIT REQUIRED

Traditional power must use a physical barrier such as metal-clad cables (Type MC) or conduit. Because Class 4 circuits are automatically protected against potential fire hazards, NEC® 2023 Article 726 permits the installation of Class 4 circuits without requiring conduit or metal cladding. This allows Class 4 cable installations to be completed quickly and any future upgrade or replacement can be conducted more easily. Thus, Operation & Maintenance (O&M) improvement is another advantage of the Class 4 system.



## UL 1400 PUBLISHED IN 2022

UL 1400-1 and UL 1400-2, Outline of Investigation for Fault-Managed Power Systems – Part 1: Equipment Safety and Part 2: Cable Requirements

were both published in 2022. Part 1 covers power distribution systems that utilize sophisticated monitoring and control methods to mitigate the risks of fire and shock normally associated with Class 2 circuits. Part 2 lists specific qualifications for Class 4 cables including CL4P (plenum cables), CL4R (riser cables) and CL4 (general purpose cables).



## SINGLE CERTIFIED SYSTEM WITH DEVICES & CABLE

The UL FMP standard requires the transmitter, receiver, and cables be tested and certified as an integrated system. NEC Section 726.170 requires all active components in Class 4 system and its connecting

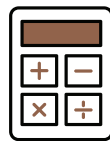
hardware to be listed per UL-1400 and produced by the same manufacturer. Class 4 cables must be UL-1400-2 certified to work with the active components. Class 4 transmitters should be clearly and durably marked with its maximum voltage and current output. Class 4 connectors are not interchangeable with non-power-limited sources located on the same premises, so the listing information should include compatible devices.



## DIVERSE CURRENT & FUTURE APPLICATIONS

NEC® prohibits the use of Class 4 systems in dwelling units, but it is permitted to be used in many diverse commercial locations. Class 4 systems can deliver more than 20 times the power

of a single load compared to Class 2 circuits without compromising safety. Existing applications include smart commercial buildings, stadiums, wireless access points, 5G/telecom radio heads and antennas, as well as indoor agriculture or vertical farming. New applications are also possible in solar, EV charging, temporary power, cloud storage or data centers, military communications, grid modernization, warehouses, and more.



## AMPACITY & VOLTAGE DROP CALCULATIONS

Class 4 is best suited for long-distance cabling, as there is no length limitation per UL. This contrasts with Power over Ethernet (PoE), which maxes out at 328 feet or 100 meters. Factors such as ambient conditions, number of conductors, and operating temperatures can impact the cable ampacity. Traditional voltage drop calculations might need to be modified for Class 4. Southwire's CableTechSupport™ Services team can help size the conductor to deliver the required ampacity at specific conditions for the longest route while meeting the maximum 3% voltage drop per NEC®.



## GAIN INSPECTOR'S APPROVALS

New NEC® articles can be difficult to understand and implement. Southwire can be your trusted partner in guiding you through the new Class 4 standard. Southwire's CableTechSupport™ Services team includes members with Ph.D. and Master of Science degrees along with Professional Engineer (PE) certifications. The team resolves more than 15,000 technical requests with over 100 signed engineering letters submitted yearly. Our subject matter experts help to gain approvals from inspectors or Authorities Having Jurisdiction (AHJ) to avoid project delays. Contact [CableTechSupport@southwire.com](mailto:CableTechSupport@southwire.com) today to receive your free consultation.



REINFORCED  
RESILIENT  
RELIABLE

## CLASS™ CLASS 4 CABLE

Southwire's new CL4SS™ Class 4 Cables are Reinforced, Resilient, and Reliable because we only use the highest-quality copper conductors, premium raw materials, and PVC insulation and jacket extrusion equipment. All CL4SS™ Class 4 cable products are certified to the UL 1400-2 standard. Our Class 4 cables meet multiple sustainable attributes from vertically-integrated raw material production, safety enhancement during use phase to the end of the life cycle. Scan the QR code to access the spec sheet online.



ACCESS SPEC SHEET



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## R&D CENTER OF EXCELLENCE

Testing and qualification of our new CL4SS™ Class 4 cables per UL 1400-2 is completed by Southwire's Cofer Technology Center located

in Carrollton, Georgia. It is an ISO-certified, UL and CSA recognized testing facility to perform electrical, thermal, mechanical and forensic investigations. A dedicated formulation team develops and evaluates new dielectric materials including PVC and other compounds. Southwire's R&D center of excellence delivers products that meet the most stringent quality standards.



## BUY AMERICA, BUY AMERICAN

All raw materials including metals and compounds sourced for drawing, extrusion, and the packaging are made in the US. Southwire's new CL4SS™ Class 4 cables meet the Buy

America & Buy American (BABA) policy and are fully compliant with the 49 U.S.C. § 5323(j) regulation. Our Made-in-America products can be specified for any programs under the Bipartisan Infrastructure Law (BIL) including DOE, DOT, and FCC's 5G deployment.



## HIGH PURITY, LOW RESISTANCE COPPER

Southwire Continuous Rod (SCR®) systems deliver over 50% of the global supply of continuously casted copper rod, which is the primary raw material to make wire and cable products. Southwire's soft-drawn copper conductors have been specified for critical infrastructure applications. The new

CL4SS™ Class 4 cables are also produced with the highest-purity copper meeting the maximum DC resistance requirements per ASTM standard via the patented SCR® process.



## BUSINESS CONTINUITY, SECURE SUPPLY

Southwire, one of the largest wire and cable producers in North America, has invested heavily in the manufacturing facilities where we make many products including low voltage wiring and CL4SS™ Class 4 cables. Older machines are replaced with new equipment to perform drawing, stranding, extrusion, plexing, and jacketing. The expanded production capacity in different states improves agility and business continuity, allowing us to service more customers under all circumstances. Scan the QR code to learn more.



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## QUALITY ASSURANCE

The PVC insulation used on Southwire's Class 4 cable undergoes spark testing under AC rms voltage of 4.5 kV after extrusion. 100% of production cables are tested at the factory and any batch with spark test faults will be rejected.

The final Class 4 cable assemblies are also subjected to a Dielectric Voltage-Withstand test to capture any insulation failures under a rms test potential of 2 kV applied for at least 2 seconds. Southwire operates and calibrates all quality test equipment per UL 2556.



## INVESTING VOLTSERVER'S DIGITAL ELECTRICITY™

Continuing our tradition of innovation in new technology, Southwire has recently partnered with VoltServer, Inc. to help lead the transition to digital power. VoltServer is the inventor of Digital Electricity™ (DE), a novel system that combines the AC power with the safety and simplicity of Power over Ethernet (PoE). We will continue to collaborate to develop new solutions and together we will help advance DE in intelligent buildings, 5G infrastructure, and wireless densification. Scan the QR code to learn more.



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