Power, Safety, and Serviceability at 1500 V DC: RADSOK® in SURLOK Plus® Connectors for ESS, EV, and Data Center Power

How low-resistance contacts and touch-safe, field-installable housings de-risk high-voltage projects

Overview

As energy platforms shift from 1000 V to 1500 V DC, interconnects must deliver higher power density, lower thermal rise, safer handling, and faster field service. SurLok Plus®—built on R4 RADSOK®—pairs low contact resistance with low insertion/separation force in a compact, touch-safe, sealed housing. With quick-lock, press-to-release mating and sizes spanning 8.0 mm and 10.3 mm (featured here), SurLok Plus® helps EPCs and OEMs accelerate ESS builds while maintaining compliance and serviceability.

I. Market Drivers & Pain Points | Why 1500 V Changes Connector Requirements

Utility-scale BESS projects are migrating to 1500 V DC strings to reduce conductor mass and I^2R losses, but that raises expectations on connectors: manage thermal rise at higher power density, maintain touch safety, and enable rapid, repeatable field installation by mixed crews on aggressive schedules.

Industry Trends at a Glance | From 1000 V to 1500 V—What Changes

Moving from 1000 V to 1500 V typically cuts DC current by ~31–37% for the same power—freeing thermal margin and reducing BOS copper, terminations, and loss. This shift favors compact, keyed, touch-safe interconnects that support sealed operation and fast service.

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II. The SurLok Plus® Solution

Core technology/product explanation.

RADSOK® uses a stamped, formed, high-conductivity grid to expand effective contact area and distribute normal forces around the pin. Result: low contact resistance, low insertion force, and robust performance under vibration/cycling with a self-cleaning action. SurLok Plus® packages that contact system in a touch-proof, environmentally sealed housing with a quick-lock/press-to-release latch and multiple keyways to prevent cross-mating. IP67/IP6K9K is attainable when properly mated.

Inside the Tech: R4 RADSOK® in SurLok Plus®

Contacts:

- R4 RADSOK® lamella/contact grid for low mΩ interface and low insertion effort.
- Housing: Compact, touch-proof shells with visual/ tactile latch feedback; multiple mechanical keyways and color options for polarity and circuit coding.
- Terminations: Crimp (Gen 1), threaded, and busbar variants to fit cables, panels, or busbars.

Selecting 8.0 mm vs 10.3 mm and Deploying in Racks

For BESS racks, 8.0 mm supports compact 1500 V rack-to-rack or pack harnesses (EMI/HVIL versions available), while 10.3 mm addresses higher-current paths where thermal headroom and service loops are priorities; straight and right-angle plugs are available to optimize routing.

Data-Center Focus: EMI-Shielded & HVIL Variants (8.0 mm & 14 mm)

Alternates: EMC & Interlock Options | EMI/HVIL for EMC-Sensitive Bays

Why it matters

In battery rooms and power aisles, high di/dt events and dense routing elevate EMC and service-safety requirements. SurLok Plus® offers **EMI-shielded** versions and **HVIL (High-Voltage Interlock Loop)** options in **8.0 mm** and **14 mm**, pairing low-resistance R4 RADSOK® contacts with shielding and interlock features to support controlled, predictable maintenance.

What these variants add

- **EMI shielding:** Reduced radiated emissions; improved enclosure compliance in rack-adjacent bays.
- **HVIL path:** Control-level interlock opens first, commanding safe power-down before separation.
- **Service confidence:** Touch-proof housings, keyed interfaces, audible/tactile mate feedback.

Integration notes (qualitative)

- Bond shields at one defined end; verify cabinet ground scheme early.
- Route HVIL conductors away from noisy power paths; confirm continuity behavior during mate/demate.
- Validate enclosure RF seals, cable braids, and gland terminations as a system.

Quick selection checklist

- Need EMC mitigation in tight bays? → **Start with 8.0 mm EMI**.
- Higher current + EMC concern? → **Evaluate 14 mm EMI**.
- Interlock required by SOP? → **Specify HVIL option** and define logic.
- Confirm latest **UL/TÜV** listings and IP ratings for the exact part variant.

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III. Technical Specifications

Electrical

Voltage systems supported: 1500 V DC (and 1000 V DC deployments).

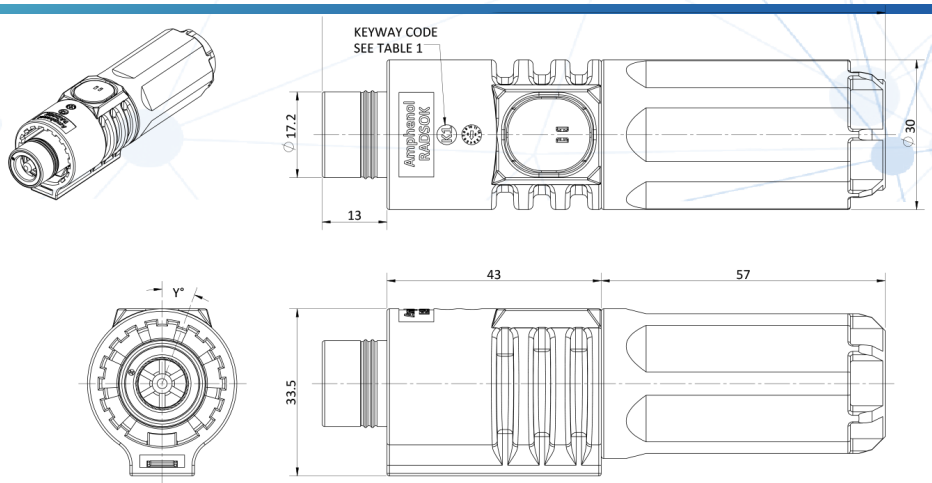
- Typical current envelopes (size/cable dependent):
  - 8.0 mm: ~150–200 A
  - 10.3 mm: ~250–300 A (See catalog/derating for exact conditions.)
- Contact system: RADSOK® low-resistance interface (low insertion force).
- EMC/EMI: EMI-shielded versions with HVIL available for EMC-sensitive bays and safe interlock signaling.

Mechanical

- Form factors: straight and right-angle plugs; inline plug option for mid-span disconnects and service loops.
- Keying: multiple keyway codes; color options for polarity and circuit differentiation.
- Terminations: crimp, threaded, busbar (see series catalog for part-level details).
- Operating temperature: –40 °C to +125 °C.

Environmental

- Ingress Protection: IP67/IP6K9K when properly mated (variant dependent).Safety: touch-proof housings, keyed anti-mismatch design.
- Compliance: UL1977/UL4128, TÜV 2PfG 2740, RoHS, REACH (verify final approvals in current catalog).



IV. Proof Points & Compliance

Performance Verification | Test Methods & Acceptance Criteria

- Thermal performance: low-resistance RADSOK® contacts help reduce thermal rise at target currents; 1500 V architecture lowers current for same power, further improving thermal margin. (Reference derating and test curves in catalog.)
- Reliability: touch-safe latch, keyed mating, and sealed housings support repeatable installation and maintenance.

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SurLok Plus® in Utility-Scale BESS
Client Background

Customer A is an EPC/integrator specializing in 1500 V DC solar-plus-storage projects. Typical deployments: 100–300 MWh, modular containerized racks, aggressive build schedules, mixed field crews.

The Challenge

At 1500 V DC, the customer needed high-current terminations that fit a tighter enclosure footprint, supported field crimping, and cut assembly time without sacrificing touch safety. Legacy lug solutions drove rework due to torque errors and inconsistent thermal rise at 300 A+.

The Solution

Amphenol Industrial Operations proposed SurLok Plus® with R4 RADSOK® contacts—specifically the 10.3 mm inline plug for mid-span disconnects and clean service loops. The team standardized keyed variants for each DC string, adopted color coding for polarity, and used matched cable OD and sealing components to maintain IP67 when mated. Field crews used calibrated crimp tooling per drawing callouts; quick-lock, press-to-release latching removed torque steps entirely.

Key Results

Install time per rack harness: **–34%** (from 62 to 41 minutes, median, n=40 racks).
Rework on terminations: **–78%** (torque-related issues eliminated).
Thermal rise at 320 A: **≤ 45 K** (vs. legacy 58–62 K, 25 °C ambient, steady-state).
Footprint: **–22%** conductor mass per rack by moving to 1500 V strings and right-sized cable.
Safety: Zero touch-safety incidents; keyed mis-mate events reduced to zero in commissioning.

Conclusion / Next Steps

Standardizing on SurLok Plus® at 1500 V DC delivered faster builds, lower thermal rise, and cleaner serviceability in a compact envelope. To evaluate SurLok Plus® (including 8.0 mm and 10.3 mm options) for your BESS program, contact Amphenol Industrial Operations for sizing, keying, and sealing guidance.

"The 10.3 mm inline SurLok Plus® gave us the current we needed in a smaller package. Tool-free latching and field crimping saved days across the site—and we stopped chasing torque errors."

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V. Business Impact & Next Steps

Benefits: Performance, Safety, and Serviceability

Faster builds: Quick-lock/press-to-release mating and field-crimp process reduce install time and rework. (Case study: –34% time, –78% rework.)

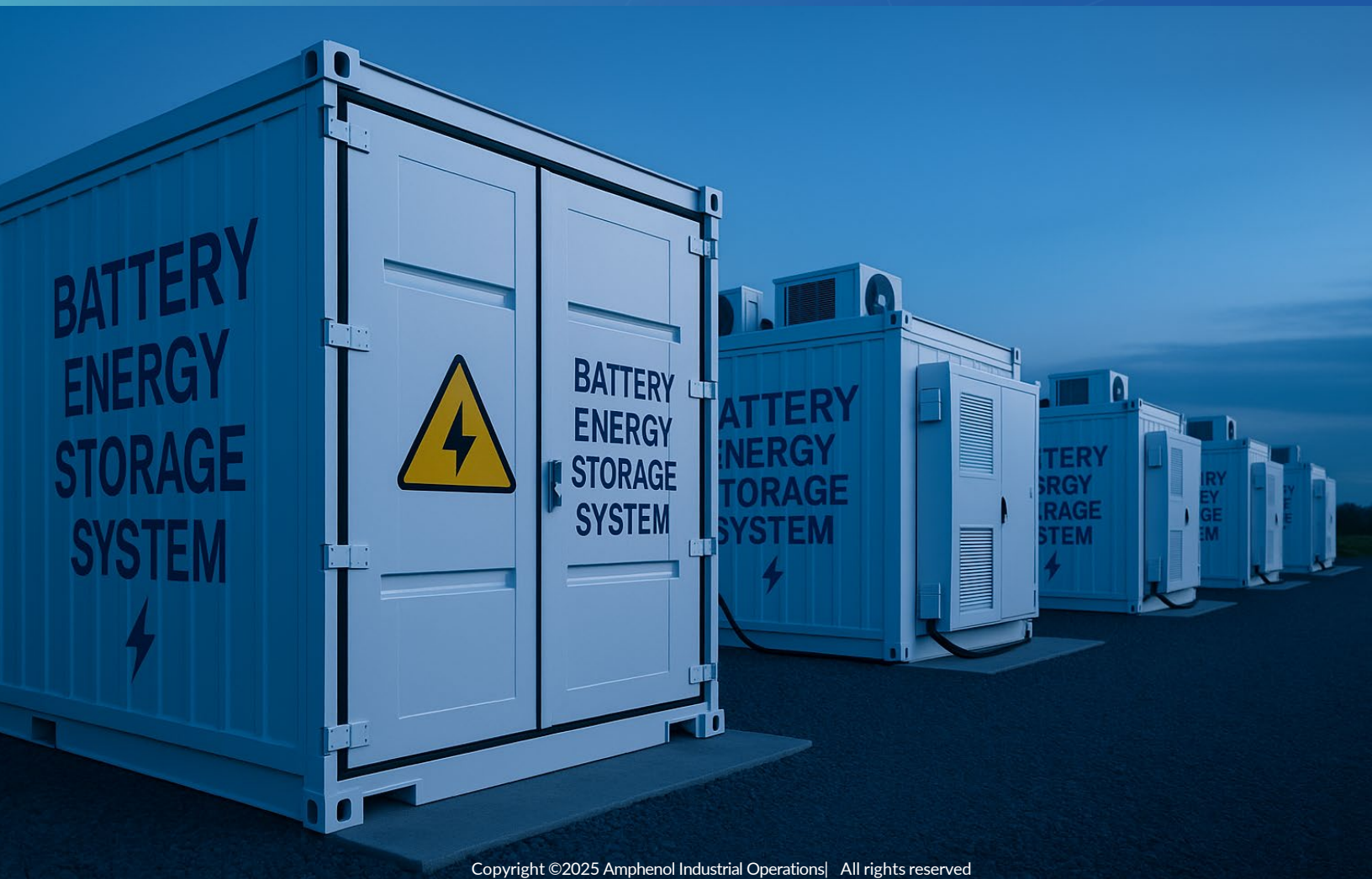
Higher power density, safer handling:

- RADSOK® lowers contact resistance and insertion force; touch-proof housings with keying reduce incident risk.
- **System efficiency:** 1500 V architectures reduce current for the same power, cutting I^2R losses and copper mass.

Compliance & longevity: IP67/IP6K9K (mated), UL/TÜV listings, RoHS/REACH support qualification and long-life operation.

Where to Go from Here | Ready to Evaluate SurLok Plus®

SurLok Plus® with RADSOK® provides a proven path to compact, safe, and serviceable high-power connections at 1500 V DC. To evaluate 8.0 mm and 10.3 mm options (including inline and EMI/HVIL variants) for your next BESS release, contact Amphenol Industrial Operations or visit the SurLok Plus® product page.



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RADSOK® Power Products

Austin is a Product Manager at Amphenol Industrial Operations and holds a Bachelor's degree in Business Administration from SUNY Potsdam. In his role, Austin defines product strategy and roadmaps for industrial interconnect solutions, conducting market research, capturing customer requirements, and prioritizing features that balance performance, manufacturability, and cost. He works closely with R&D and manufacturing teams to shepherd products from concept to production and coordinates with sales and customer support to ensure successful market adoption.

A collaborative communicator, Austin emphasizes data-driven decisions, continuous improvement, and strong stakeholder engagement. He enjoys mentoring team members and fostering alignment across operations, supply chain, and quality to deliver dependable products for industrial customers.

Company Profile

Amphenol Industrial Operations Endicott NY

Amphenol Industrial Operations, headquartered in a 50,000 square foot facility in Endicott, N.Y., provides a full range of high reliability power/signal connectors and interconnection systems specifically for the industrial markets including rail/mass transit, process control, automotive manufacturing, heavy equipment, wireless base stations and petrochemical/power generation.

Products include ruggedized-for-industry cylindrical, rectangular, fiber optic, signal and power, RADSOK power and power-to-board solutions, cable and harness assemblies, as well as industrialized versions of Amphenol's MIL-DTL-5015 cylindrical, MIL-DTL-26482 miniature cylindrical and GT reverse bayonet cylindrical connectors. Amphenol Industrial Operations employs more than 1,400 people globally and is ISO9001, TS96949 and MIL-STD-790 certified.

Amphenol Technology (Zhuhai) Co., Ltd

Established in 2007, Amphenol Technology (Zhuhai) Co., Ltd. is a manufacturing facility for Amphenol Industrial Operations, which serves a number of industrial markets. Included but not limited to Factory Automation, Transportation, Heavy Equipment, Alternative Energy, Energy Storage. Server/DataComm and Power Distribution.

With industry leading engineering, design and manufacturing expertise, Amphenol Technology(Zhuhai) Co., Ltd. has earned more than 60 utility patents on its innovative interconnects. Many of the products produced have been certified by independent standards including UL, IEC/TUV, ATEX, IECEx and MA. The facility is also certified to ISO 9001, ISO 14001 and IATF 16949.