BRUSH Engineered Solutions
INNOVATION

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POWERBOND™

WHITEPAPER

PROVIDING SAFER AND FASTER ISOLATIONS OF THE DC RAILWAY

An innovative solution for today's DC rail and transit networks

Undertaking trackside maintenance is often a complex process. And when working in these high-speed, electrified areas, reducing and mitigating safety risks to the workforce must be the number one priority.

For the routine maintenance of rail power equipment, before work can begin, the contact line must be safety isolated and short-circuited to earth.

Traditionally, this isolation method has meant opening and locking off the contact line circuit breaker and then physically fitting (and later removing) a short-circuit strap between the contact line and earth, which exposes the maintenance team to hazards associated with the operational railway.

The placement and removal of these temporary short-circuit straps takes time, and along with the inherent safety risks associated with working in such a high-risk environment, the process also exposes the network to over-running maintenance works. With many railway operations interacting with each other, often across several systems, isolating even just one element can have a significant impact across the network.

POWERBOND™ Key benefits

- Lower cost of ownership
- Proven design
- Smaller footprint
- Custom solutions
- Award-winning magnetic actuator technology
- Operator safety
- Network Rail approved

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AT A GLANCE...

Designed for 750V DC and 1500V traction power systems both overhead line and conductor (3rd and 4th) rail, **PowerBond** is an air-insulated, air-break, high-speed direct current circuit breaker which allows direct current contact line systems to be fed from the traction power supply, or alternatively to be bonded to negative/earth.

Trackside innovation

With a focus on safety, the company's Research & Development (R&D) team worked in conjunction with Network Rail to develop a solution that not only enhanced the safety of track workers and substation maintenance teams, but also improved the installation and maintenance process.

From the outset, the R&D team knew that it was essential that any new solution occupied the same footprint as existing switchboards. Not only would this allow for ease of installation, but it would also ensure minimal installation works would be required, aiding retrofit and reducing the requirement for trackside access, as well as minimising associated installation costs.

Additionally, it was clear that ensuring all equipment could be maintained while totally isolated from all sources of traction voltage, was vitally important.

Integrated dual functionality

And so, PowerBond was born. An innovative, single-piece apparatus with all maintainable elements of equipment located within a withdrawable circuit breaker truck, that improves the safety, speed, and efficiency of electrical isolations across the rail network.

Within the robust, self-contained **PowerBond** unit, the busbar selector is in the same withdrawable truck as the circuit breaker, the current measurement shunt or sensor, the voltage transducers, and associated fuses.

When the circuit breaker truck is pulled out from the panel, the equipment can be safely maintained, totally isolated from traction voltages.

This innovative design allows the circuit breaker to continue to perform its normal current switching function, while the addition of the busbar selector determines which busbar the contact line is connected to – all within one unit.

POWERBOND™ 2-in-1 solution

- Contact line connected to the positive busbar for operation as a track power feeder circuit breaker
- Contact line connected to the negative (or earth) busbar for operation as a short-circuiting or bonding switch

Applications and use

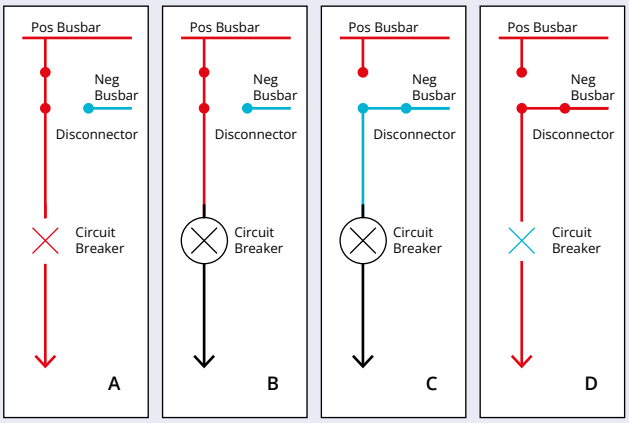
PowerBond can be employed on any 900V DC and 1800V DC traction power network, using third-rail, fourth-rail, or overhead line, for both heavy and light rail and for rapid transit and tram systems, making it the ideal solution to provide safer and faster electrical isolations.

At the core of **PowerBond** is a busbar selector switch which connects the circuit breaker to either the positive busbar, for operation as a track feeder circuit breaker, or to a negative (or earth) busbar, for operation as a short-circuiting or bonding switch.

The advanced design configuration of the busbar selector means that only one busbar is connected at any time. To further improve safety, shutters automatically close to cover the busbar when not connected.

The patented design and magnetic actuator offers reduced maintenance and improved performance against other operating mechanism types.

Fully customisable control and protection scheme, which is compatible with a wide range of protection relays including the **BRUSH Switchgear Mitre+**.



In **Figure A** the circuit breaker is closed, supplying power to the contact line. The busbar selector is set to connect the circuit breaker to the positive busbar. All protection devices are operational.

In **Figure B** the circuit breaker is open, not supplying power to the contact line, but available to do so. The busbar selector is set to connect the circuit breaker to the positive busbar.

In **Figure C** the circuit breaker is open, not supplying power to the contact line, and inhibited from doing so. The busbar selector is set to connect the circuit breaker to the negative busbar.

In **Figure D** the circuit breaker is closed, safely earthing the contact line through the negative busbar. The busbar selector is set to connect the circuit breaker to the negative busbar. All protection devices disabled for secure bond.

Switching modes

The busbar selector connects the input side of the circuit breaker either to a positive (power supply) busbar or to a negative (or earth) busbar, but never both at once. The circuit breaker system therefore acts either as the normal power supply circuit to the contact line or as the short circuit strap between the contact line and earth.

Control options

Designed from the outset for local control, control from a local control panel, or for remote operation, **PowerBond** can also be fitted with relays to enable remote securing in the safety earth bond position.

As a two-in-one solution, **PowerBond** offers a major benefit in substation design and construction. The footprint (**PowerBond** measures just 450mm wide) means that the equipment can be retrofitted in the existing substation without significant civils work. Allowing for the introduction of additional bonding functionality and interlocking within the same footprint as BRUSH Lightning switchgear.

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Novel technology

An innovative solution, POWERBOND™ offers:

- Enhanced safety
- Ease of installation
- High-performance
- Reduced site works
- Ease of maintenance
- Low-cost solution
- Minimal footprint
- Award-winning magnetic actuator technology

More information

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Our solutions

Supporting the drive to net zero

Engineered to perform

Innovative by design