

Navigating the Deep: Seamless Subsea Connectivity with Pure Embedded Ethernet

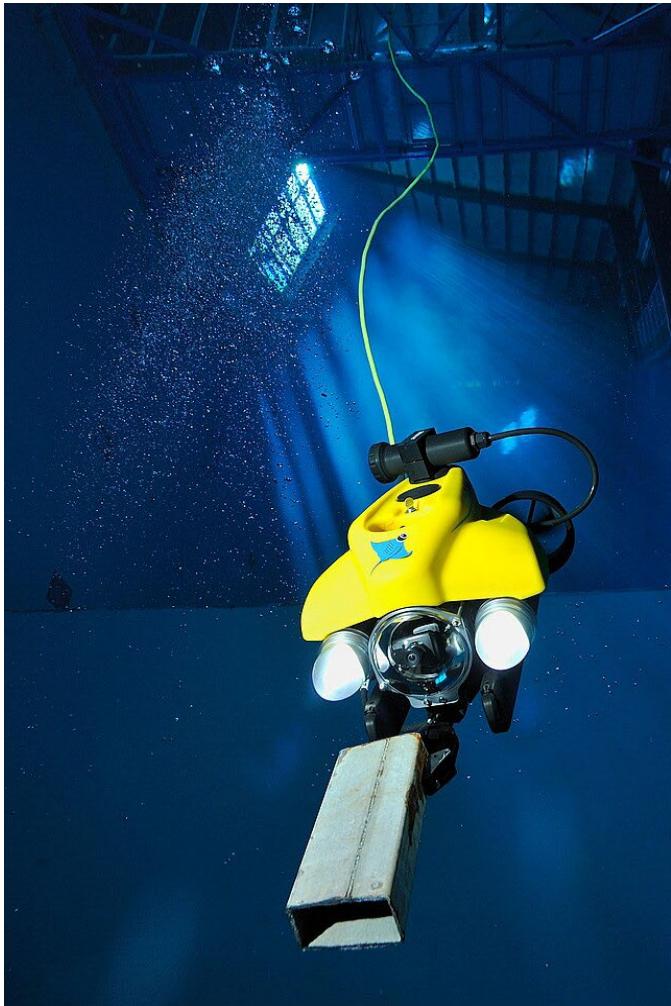
Brainboxes High-Performance Networking Solution for extreme conditions



Subsea environments present some of the toughest challenges for networking and communication. Fluctuating temperatures, extreme pressure, and the corrosive effects of saltwater mean that traditional connectivity options like RF and cellular cannot operate reliably underwater. High signal attenuation and poor propagation cause higher-frequency signals to be absorbed, limiting communication to short distances. As a result, finding dependable networking solutions for mission-critical subsea operations is challenging, with insulated copper or optical wires remaining the only practical options for reliable communication.

Whether used for underwater inspection or maintenance, underwater technologies and monitoring stations require a compact networking solution that integrates with their streamlined designs, while ensuring reliability in harsh subsea conditions. However,

even traditional wired networking solutions often fail to meet the extreme demands of the deep sea.



Underwater technologies such as remotely operated vehicles (ROVs), autonomous underwater vehicles (AUVs), and deep-sea monitoring stations rely on a constant stream of real-time data to carry out vital tasks. They depend on receiving accurate information from onboard sensors and cameras for navigating, identifying objects, or completing precision tasks. To ensure efficient operation, they require a stable and robust networking solution that can withstand the subsea environment.

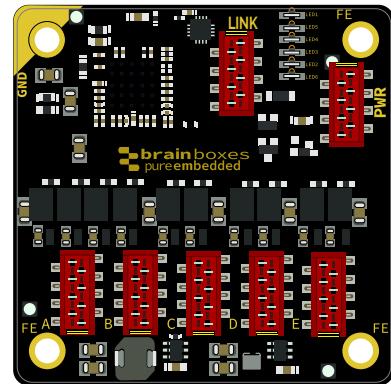
Beyond ROVs and AUVs, underwater monitoring stations are essential for long-term oceanographic research, climate monitoring, and offshore energy applications, requiring uninterrupted communication to maintain continuous connectivity with satellite or surface data relay points. Additionally, industries such as oil, gas, and renewable energy require

dependable networking for remote monitoring and control, ensuring operational efficiency and safety in demanding subsea conditions.

Fortunately, Brainboxes developed the Pure Embedded Ethernet Switch range of compact, high-performance networking solutions designed to withstand harsh environments. With a wide operating temperature range, the Pure Embedded Switches ensure durability and reliability in deep-sea deployments where stable, long-term performance is crucial to allow underwater vehicles to operate without interruptions or data loss.

Smaller than a standard business card, Pure Embedded switches are the ideal solution for compact subsea technologies like ROVs and AUVs. Their ultra-compact form factor enables integration into space-constrained enclosures without impacting vehicle payload capacity.

Logical component placement, fixed distances, and versatile connectors ensure seamless integration, maximising space efficiency without compromising Ethernet performance. This frees up room for additional sensors and equipment essential for successful subsea operations. The switches also provide flexible connectivity with both board-to-board and board-to-cable options, while common IDC-style connectors ensure compatibility with a wide range of underwater systems.



TSC Subsea is a leader in designing, manufacturing, and operating advanced subsea inspection equipment, leveraging cutting-edge NDT science and technology. Their award-winning robotic systems rely on seamless connectivity to integrate with third-party equipment in challenging underwater environments.

Jake Moore MEng (Hons), Electronics Engineer at TSC Subsea, explains why Brainboxes switches are the natural choice:

"The compact size, reliability, and feature-set, of Brainboxes range of network switches has many times made connecting to 3rd party equipment much more straight forward than it otherwise could have been."

The introduction of Gigabit to Brainboxes' Pure Embedded Range makes fast, uninterrupted data transmission possible even at extreme depths. This high-speed capability supports critical subsea tasks such as high-resolution sonar imaging, sensor data collection, and underwater telemetry. By integrating these switches into subsea technologies, operators can gather more accurate data for applications like underwater research and offshore energy monitoring.

As advancements in underwater exploration and monitoring technologies continue to evolve, efficiency and miniaturisation are becoming growing trends. This shift is mirrored in other cutting-edge fields where weight and space are at a premium, such as aerospace, autonomous systems in high-altitude applications, and industrial automation. These industries increasingly rely on lightweight, high-performance networking solutions to support the next generation of mission-critical technologies.

Brainboxes' Pure Embedded Switch range is the perfect fit to fulfil these needs, with the compact design, rugged durability, and high-speed data capabilities ideal for the harsh environments of both deep-sea operations and any other application requiring robust connectivity in extreme conditions.

Durable embedded networking solutions will continue to drive smarter, more efficient operations in the years to come. Backed by a 10-year stability guarantee, the Pure Embedded range ensures long-term availability and reliability, making it the trusted choice for applications where space is limited but data transmission demands are high.

By providing robust, future-ready networking solutions, Brainboxes ensures seamless connectivity even in the most challenging environments, shaping the next generation of innovations beneath the earth's surface and beyond.