

Explosion Protection & Integrated Technologies for the Safe Hydrogen Transition



A Vision from Martin Schefter

Hydrogen is more than a promising energy carrier. It is emerging as one of the key building blocks of a sustainable and decarbonised global economy.



We know that real innovation only happens when safety and performance go hand in hand.

Hydrogen is being recognised for its potential to connect renewable energy with sectors that are difficult to electrify. From green steel production and chemical processing to heavy-duty transport and long-term energy storage, hydrogen has the power to reshape the way we generate, move and use energy. The pace of innovation is accelerating. The momentum is real. And the stakes are high.

With this opportunity comes a clear responsibility. Hydrogen is not only a valuable fuel. It is also a volatile one. Its small molecular size, wide flammability range and low ignition energy make it uniquely challenging to manage safely. These are critical risks that must be addressed from the outset with certified technology, deep expertise and a clear focus on long-term operational safety.

At BARTEC, we have spent over five decades protecting people, the environment and assets in some of the world's most hazardous industries. From oil and gas platforms to chemical plants and energy infrastructure, we know what it means to engineer safety in complex, high-risk environments. And we know that real innovation only happens when safety and performance go hand in hand.

That is why we are bringing our full expertise to the hydrogen sector. Our explosion-protected technologies are designed to meet the specific demands of hydrogen across its full value chain. But our role goes beyond equipment. We support our customers with engineering services, compliance guidance and long-term lifecycle support. We partner with you from the first planning stages to full-scale operation.

This brochure is more than a showcase of our capabilities. It is an open invitation to work together. Let us help you build a hydrogen infrastructure that is not only efficient and forward-looking but fundamentally safe. Every process and every installation must start with protection. That is our role at BARTEC. And that is the commitment we stand behind.

A handwritten signature in black ink that reads "Martin Schefter".

Martin Schefter
Chief Executive Officer
BARTEC Group

Hydrogen: Market Momentum & Risk Landscape

There is no denying the momentum behind hydrogen. Economies worldwide have placed hydrogen at the heart of their climate and industrial strategies, with billions in investment flowing toward green and blue hydrogen production, storage solutions, and distribution infrastructure.

Large-scale electrolyzers, hydrogen refueling networks, fuel cell technology, and cross-border hydrogen pipelines are moving from vision to reality. These projects promise to reduce CO2 emissions dramatically, support energy independence, and enable a circular economy powered by renewables.

Yet with this momentum comes a significant risk profile. Hydrogen's technical properties are well known among engineers, but the new pace and scale of deployment make managing these hazards more critical than ever. Hydrogen has a flammability range from roughly 4% to 75% by volume in air — far wider than methane. Its ignition energy is among the lowest of all industrial gases, and its small molecular size means leaks can develop unnoticed and spread rapidly. In enclosed or congested areas, a hydrogen-air mixture can be ignited by the smallest static discharge, potentially leading to devastating consequences.

“Hydrogen can transform our energy future – but only if safety is engineered from the start.”

At BARTEC, we know that every link in the [hydrogen value chain](#) must be secured with explosion-protected technology designed for these challenges. Our solutions address risks from the molecular scale — with reliable process analysis and leak detection — to megawatt-scale infrastructure, where certified enclosures, trace heating, and safe control systems safeguard production, compression, and fueling. We also understand that a

hydrogen accident does not only harm assets and operations; it can damage public confidence in the entire energy transition.

That is why our mission is to deliver uncompromising safety, built on decades of protecting hazardous installations worldwide. With BARTEC, you gain a partner who treats hydrogen's risk landscape with the seriousness it deserves, while helping you move forward confidently toward a sustainable, low-carbon future. Because safety is not an obstacle to progress — it is what makes progress possible.



Where We Fit in the Hydrogen Value Chain

Hydrogen is rarely produced and consumed in one place. It travels through a complex chain of processes — starting with renewable power conversion through electrolysis or reforming, followed by compression, liquefaction or storage, transport through pipelines, trucks or ships, and ending in final use across mobility, power, or industry. Every stage of that value chain introduces unique hazards, where uncontrolled ignition could disrupt not just local operations, but entire communities and networks.

Safety from Production to Transport

BARTEC's portfolio is designed to safeguard this entire journey of hydrogen. In production facilities, our certified control cabinets, explosion-protected junction boxes, and analyzers enable safe operation of electrolyzers and reformers. Our solutions help operators monitor temperatures, control process parameters, and ensure the purity of hydrogen streams, reducing the risk of uncontrolled releases.

In transport and storage, BARTEC trace heating systems prevent line blockages and maintain safe flow conditions even in freezing climates, while our

enclosures and control units protect critical monitoring electronics against ignition sources. We help prevent condensation and ice formation in cryogenic hydrogen systems, enabling secure transfer between production, storage, and final use.

Reliable Operation at the Point of Use

Finally, at the point of use — whether that is a hydrogen fueling station, industrial burner, or fuel cell application — BARTEC provides intrinsically safe mobile devices and connectivity platforms, allowing operators to work efficiently and safely in hazardous zones. Our rugged devices support data collection, communication, and inspection even where explosive atmospheres are present, enabling digital transformation without compromising safety.

Bringing these systems together is what makes BARTEC unique. We combine reliable hardware, deep engineering expertise, and project support to offer an end-to-end approach to hydrogen safety. Whether you are developing a small pilot or a gigawatt-scale facility, you can trust BARTEC to secure your hydrogen investment and help you build a truly safe, resilient hydrogen value chain.



Advanced Safety Systems for Hazardous Environments

Engineered to deliver the highest level of safety and ensure reliable performance in high-risk applications.

Operating & monitoring systems

Our reliable [POLARIS HMI](#) series ensures safe and intuitive asset control. With certified explosion protection and standard interface, it controls and operates at pressure or gas levels before flammable hydrogen mixtures form.

Automation interfaces

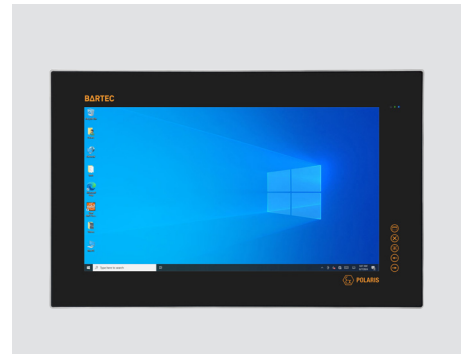
[MODEX I/O](#) modules provide safe signal transmission of standard bus systems in hazardous areas. Together with POLARIS HMIs, form the signal in- and outputs to the control and visualization of the system, ensuring safety while maintaining seamless data flow across your hydrogen plant.

Control panel solutions with built-in electrical components for hazardous areas

Our [explosion-protected solutions](#) are designed to constrain internal faults and prevent hydrogen ignition. Each solution is custom-engineered to meet site-specific requirements, ensuring reliable power management, full regulatory compliance, and long-term durability. Especially in electrolyzer applications, our control panels can guarantee high levels of safety. They can be designed with various protection types, including Ex p, Ex d and Ex e, based on the specific needs of the application and the hazardous area classification. We provide a wide range of explosion-protected components and systems certified for hydrogen environments. These enable scalable, tailored integration into advanced hydrogen electrolyzer architectures, while meeting all applicable standards.

LED Lighting

Our advanced [LED fixtures](#) minimize heat and eliminate the risk of electrical sparks, preventing ignition in hydrogen zones. They deliver strong illumination for safer work environments, while saving energy and reducing maintenance.



Safe Hydrogen Transport and Storage through Electric Trace Heating

Freezing liquids can cause major damage due to their expansion, causing pipes and vessels to burst and leak.

Hydrogen transportation pipelines are typically operated at up to 100 bar (1450 psi) pressure and roughly 20 °C (68 °F). They need to be kept at this temperature even during the harsh winter to avoid ice build up and condensation, which can lead to damages in the pipework and thus leakage of the hydrogen, leading to an explosion hazard.

The distribution pipelines are operated at lower pressures and thus require lower temperatures, which need to be specifically taken care of in order to avoid condensation of the surrounding humidity.

The same holds true for hydrogen tanks on the road. Highly pressurized hydrogen can leak through the tiniest cracks, so a tank with good temperature control is required to prevent cracking through freezing or through stress in the tank due to temperature differences.

Hydrogen does not only need to be transported, but also stored. Many storage tanks are kept at lower temperatures well insulated on asphalt

foundations. However, the foundations still need to be heated in order to avoid stress cracks within the material itself.

[BARTEC trace heating systems](#) will keep pipes and tanks operational, and foundations heated, preventing bursting and cracking via frost protection and tight temperature control. Thus, the risk damages and the resulting explosion hazard as well as financial loss can be mitigated.

BARTEC [self-regulating heating cable PSB](#) is well suited for pipelines, as the power output of the cable adjusts itself to compensate for the temperature change of the pipe, leading to lower energy cost at higher temperatures like during summer. PSB cables are easy to install and design for hazardous zones, as their temperature class is entirely dependent on the chosen cable itself.

For longer pipelines, the BARTEC series resistance cable EKL are a prime candidate. Cheap and easy to install with circuit lengths up to 500 m. The design of the circuits is more complex than with the self-regulating cables. However, BARTEC developed its own software HelocPro specifically for circuit design.



Our team of trace heating experts use their vast knowledge to provide the best service to our customers along all steps of trace heating projects: project management, customized designs, material procurement, installation, start-up, commissioning and maintenance.

Enterprise Mobility for the Hydrogen Value Chain

Working with hydrogen means operating in environments where safety, reliability, and efficiency are critical. [BARTEC's intrinsically safe mobile devices](#) empower teams to work smarter and faster—without compromising safety. From production plants and storage facilities to refuelling stations and industrial end-use sites, our technology keeps people connected, data flowing, and operations compliant.

Mobile Computers & Barcode Scanners

Purpose-built for harsh, industrial environments and co-developed with Zebra Technologies, our Zone 1/Div. 1 and Zone 2/Div. 2 rugged [mobile computers](#) and [scanners](#) streamline asset tracking, inventory management, and compliance tasks in hydrogen facilities.

Applications include:

- Production & storage: Scan cylinders, pallets, and equipment for inventory control.
- Compliance: Capture and log calibration dates, safety checks, and work permits.

Key Advantages:

- Ultra-rugged design tested for the toughest industrial conditions.
- Best-in-class barcode scanning technology.
- Loaded with Zebra Mobility DNA, the industry's broadest suite of enterprise software.



Smartphones & Cameras

Our [intrinsically safe smartphones and cameras](#) combine advanced communication and imaging capabilities with the safety certifications needed for hydrogen's hazardous zones.

Applications include:

- Remote support: Live video calls directly from hazardous areas for real-time troubleshooting.
- Maintenance and inspections: record inspection data directly into maintenance and asset management systems. Capture high-resolution photos and videos for safety reporting and compliance records.

Key Advantages:

- Lightweight, compact, yet rugged design —ideal for extended use in the field.
- High-performing platform with the latest wireless technology for ultra-fast connections on remote and complex sites.
- High-resolution cameras for crystal-clear imagery and 4K video capture.

Tablets

Our Zone 2/Div. 2 certified Android and Windows tablets deliver large-screen mobility for data-intensive tasks in the field.

Applications include:

- Digital work orders: Review schematics, procedures, and checklists on site.
- Commissioning & testing: Record results during hydrogen refuelling station or pipeline startup.
- Training & safety: Access interactive training modules directly in hazardous zones.

Key Advantages:

- 10-inch high-brightness display for clear viewing in direct sunlight.
- Flexible configurations with optional premium features including integrated barcode scanners and cellular connectivity options.
- Modular design for forklift or vehicle mounting in industrial environments.

Connectivity

In today's industrial landscape, [seamless connectivity and accurate location tracking](#) are essential for both efficiency and safety—especially in hazardous environments. BARTEC deliver trusted solutions that extend wireless networks into Ex zones connecting what matters to you. Our expertise in real-time visibility of people and assets brings a range of Real-Time-Location-System and RFID solutions that ensure you can locate your people and assets with confidence. Together, these innovations form the backbone of a safer, smarter, and more connected workplace.

Seamless Wireless Connectivity

In industrial environments with explosive atmospheres, BARTEC's range of [specialized wireless enclosure solutions](#) offer purpose built products for housing radio devices with either integrated or externally mounted [antennas](#). These enclosures provide the essential Ex certification required for safely mounting wireless communication devices in hazardous areas.

Wireless radio hardware typically comes in two antenna configurations: integrated and externally mounted. These configurations significantly influence deployment strategies in hazardous areas. Extend your digital network into hazardous areas with compact, certified solutions from BARTEC:

- **EXgate™** – Next-generation Zone 1 enclosure for access points, gateways, and radios, with easy mounting and RF-transparent dome.
- **iWAP107 & iWAPXN3** – Universal wireless enclosures for Zone 1 and Zone 2, designed to host standard wireless devices from any vendor.
- **Xbeam™ Ex Antennas (0.5–6 GHz)** – Ex antennas for Wi-Fi, LTE/5G, Zigbee, WirelessHART, and more.
- **iANT Antennas** – Wide range of simple, safe antennas for hazardous area use.
- **iSOLATE501** – RF galvanic isolator enabling safe use of standard antennas in hazardous environments.

Real-Time Location Systems (RTLS)

By combining technologies like Wi-Fi, GPS, and Bluetooth Low Energy (BLE), [hybrid RTLS solutions](#) can deliver more accurate and comprehensive location data with reduced infrastructure. For companies operating in hazardous areas, a RTLS adds a critical layer of safety, security and productivity, enabling real-time tracking of personnel and assets. Locate your workforce and assets with accurate hybrid tracking:

- **iTAG XB** – A range of low cost Ex rated asset and personnel tags. Available in Quuppa or iBeacon/ Eddystone BLE options, or as a Wirepas RTLS solution.
- **iTAG X-Range** – Intrinsically safe, rugged hybrid location technology tags for worker safety and location tracking, leveraging Wi-Fi, BLE, GPS, location technologies. Available in Wi-Fi, LoRaWAN and Cellular connectivity options
- **iTAG XM App** – Turns any Ex-certified Android smartphone into a location tracking device for indoors and outdoors.
- **Extronics Location Engine (ELE)** – Software that delivers flexible, precise “dot-on-a-map” visualization with easy API integration into existing platforms.



Decades of experience in the approval of metrological measurement and monitoring systems for hazardous liquids and gases

These approvals cover both legal metrology regulations and explosion protection requirements.

Our systems are deployed along the [entire logistics chain](#). Within the hydrogen supply chain, we offer certified systems for both stationary trailer-filling stations and mobile high-pressure trailer systems. The latter are used for product monitoring throughout the entire transport route, as well as for legally approved quantity measurement during product discharge. The primary objectives of our systems are:

1. Establishing a reliable billing process between two parties
2. Achieving full transparency over all product movements
3. Maximizing safety

A core component of our legally approved system – in addition to the mass flow meter and the control unit – is at least one shut-off valve, which is controlled by intelligent system software. This ensures not only legally accurate measurement, but also continuous monitoring of the process for safety risks, with the ability to actively intervene when needed.

In the area of valve control, we possess over 30 years experience of in-house software development. While the hydrogen market is still in its early stages, our automation solutions are already well established in existing industries. Step by step, our software and Hardware are being expanded and functionalities are being adapted for the hydrogen sector to further enhance safety and transparency. As of today, both stationary and mobile trailer systems are already widely deployed in the market, with growing demand—driven especially by the increasing importance of safety.

HY COMP 



HY LOG 



HY TRACE



Proven, precise and reliable trace moisture measurement for hydrogen and natural gas applications

Introducing our highly acclaimed HYGROPHIL F 5674 Process Trace Moisture Analyzer – a trusted solution for precision moisture measurement in hydrogen production and renewable energy systems.

As renewable electricity is increasingly converted into hydrogen for decarbonization and seasonal storage, precise moisture monitoring is critical. The [BARTEC HYGROPHIL F 5674](#) ensures compliance with strict moisture limits and supports safe, efficient hydrogen operations.

In hydrogen production via PEM or Alkaline Electrolysis, water is split into hydrogen and oxygen using electricity. The resulting hydrogen can be stored, transported through existing pipelines, and later used as fuel or re-electrified. At gas regulating and metering stations, hydrogen is analysed for oxygen, nitrogen, flow rate, heating value – and especially trace humidity. Excess moisture can cause condensation, corrosion, blockages, and safety risks, making adherence to feed-in limits (e.g. 50 mg/m³) essential.

The HYGROPHIL F 5674 is robust, resistant even to water slugs, and can be independently recalibrated. Designed for low-maintenance use in small or unmanned plants, its retraction armature allows fast, interruption-free servicing.

At its core, the optical sensor uses a Fabry-Pérot Interferometer with porous silicon dioxide and zirconium dioxide layers, selectively detecting water vapour by measuring spectral shifts around 820 nm. A compact evaluation unit calculates dew point, vapour pressure, ppm, and mg/m³ values, with outputs via analogue signals, MODBUS, TCP/IP, and relays.

Trusted worldwide, the HYGROPHIL F 5674 offers reliable, long-term operation – even offshore. It is certified for hazardous areas (ATEX, IECEx, CSA) and can be integrated with sample conditioning or in-line, emission-free installations.



Integrated Solutions for Hydrogen Projects

Hydrogen installations are among the most complex engineering undertakings of our time. They combine new technologies like large-scale electrolysis with established industrial processes such as compression, storage, and distribution.

Safety by Design, Not by Chance

Add to that the high energy density and explosive nature of hydrogen, and it becomes clear: safety cannot be addressed piecemeal. It must be integrated from the start.

BARTEC offers a [comprehensive safety platform for hydrogen projects](#), ensuring every critical system works together seamlessly. Our certified equipment — from trace heating systems to control panels, hazardous-area networking, and rugged mobile devices — is engineered to function as a cohesive whole, delivering predictable, reliable protection across all project phases.

But our role goes far beyond simply delivering products. We work closely with project developers, engineering partners, and system integrators to design hydrogen facilities that meet all local and international safety standards from the first concept onward. Our specialists support risk assessments, engineering reviews, hazardous area classification, and detailed design. This reduces delays and ensures that safety is an enabler of progress, not a roadblock.

Support Across the Full Project Lifecycle

Throughout the project lifecycle, BARTEC provides documentation, training, inspection services, and even digital monitoring tools to verify and maintain system integrity. Whether you are deploying a new refueling corridor for hydrogen-powered vehicles or scaling up industrial electrolysis, you can rely on BARTEC's integrated safety framework to protect your people and assets.

By choosing BARTEC as your hydrogen safety partner, you unlock the power of a trusted expert with decades of real-world experience in explosion protection. Our integrated solutions help you move forward with confidence, knowing that your systems have been designed, installed, and maintained with the highest commitment to safety.



Regulatory & Standards Expertise

Hydrogen is governed by a fast-evolving network of codes, standards, and best practices.

From global frameworks like IECEx, ATEX, and ISO standards to national regulations and industry-specific guidelines, [compliance](#) is a cornerstone of safe and successful hydrogen projects. Keeping pace with these standards is challenging, especially as new applications emerge and technologies mature.

BARTEC's regulatory expertise gives you peace of mind. Our products and systems are designed to meet or exceed the most demanding requirements for use in hazardous areas. Our team stays continuously engaged with the latest regulatory updates, participating in standardization committees, and incorporating those insights directly into product development and project planning. This means you benefit not only from certified hardware, but also from a partner who understands the entire compliance environment.

Compliance from Day One to Long-Term Operation

Our support extends beyond technical documentation. We can assist with hazardous area classification, advise on equipment selection, and help your project teams interpret and apply relevant codes. For hydrogen developers, this is critical: ensuring conformity with all required standards from day one prevents costly redesigns, project delays, and even potential shutdowns during inspections.

In a sector moving as fast as hydrogen, where public confidence and investor trust are essential, robust compliance is a non-negotiable. BARTEC is here to help you navigate that journey, with a team that blends product expertise, engineering know-how, and a deep understanding of global regulations. Whether you are building a local refueling station or a continental-scale hydrogen backbone, we will help you build safety in from the start — and stay compliant, now and into the future.



Digital & Lifecycle Support

Building a safe hydrogen facility does not end with construction. Long-term safety performance depends on continuous monitoring, inspection, and improvement.

BARTEC supports you through the full lifecycle of your hydrogen assets, combining digital tools with proven engineering services to help you operate safely, efficiently, and with confidence.

Our digital solutions integrate condition monitoring, predictive maintenance, and advanced diagnostics into the heart of your hydrogen systems. By leveraging industrial IoT technologies, our certified equipment can deliver valuable data in real time — enabling you to detect emerging issues before they become incidents. This supports planned maintenance, extends equipment life, and minimizes unplanned shutdowns, protecting both uptime and safety.

Tailored Support That Adapts to Your Needs

Beyond technology, BARTEC offers commissioning assistance, training programs for operators,

documentation reviews, and routine inspection services. This ensures your hydrogen installation stays in peak condition, compliant with relevant codes and performing reliably even as site conditions evolve over the years.

Our support model is flexible. Whether you need a one-time inspection or a multi-year service agreement, we tailor our offerings to match your hydrogen project's complexity and scale. We understand that every hour of downtime costs money — and every safety compromise costs trust. With BARTEC as your lifecycle partner, you can protect your investment and keep your people safe for decades to come.

From first concept to final decommissioning, we stand by you with a complete, integrated support ecosystem. Because true hydrogen safety is not a moment — it is a continuous commitment.



Why BARTEC: Proven in Harsh & Hazardous Environments

For [more than 50 years](#), BARTEC has been trusted to protect people, the environment, and assets in some of the harshest, most hazardous environments on the planet.

From the deserts of the Middle East to the icy conditions of Northern Europe, from offshore oil platforms to refineries, we have seen how critical safety systems are to protecting lives and sustaining operations.

As hydrogen reshapes the energy landscape, BARTEC is uniquely positioned to deliver the same safety leadership to this vital industry. Our combination of certified products, engineering support, compliance expertise, and lifecycle services means you benefit from a single, trusted partner throughout your entire project. Whether you are building your first hydrogen pilot or scaling up to a global network of refueling stations, we can help you move forward with confidence.

Our global reach, robust supply chain, and commitment to continuous innovation ensure we deliver solutions that perform — in every climate, every application, and every stage of the hydrogen value chain. We stand ready to help you design, build, and operate a hydrogen infrastructure that meets society's sustainability goals without compromising safety.

At BARTEC, we believe the hydrogen revolution must be grounded in a culture of safety. This is not just about compliance or certification — it is about protecting people, communities, and the climate. When you partner with BARTEC, you gain more than equipment; you gain a mindset of responsibility and care.



Hydrogen is ready to power the future. Together, we will make sure that future is safe, reliable, and trusted.

Safety beyond protection

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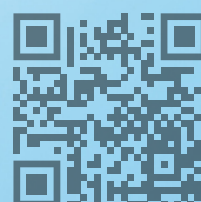
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