Solutions for hydrogen plants

Future-proof technology for the hydrogen ramp-up

Automation, measuring technology and monitoring solutions

Weidmüller

Hydrogen: The energy source of the future

Sustainable transformation of energy and industrial processes

The expansion of hydrogen is crucial for the sustainable transformation of our energy and industrial systems. It opens up new opportunities to lower emissions and decrease our reliance on fossil fuels. To fully harness hydrogen as the energy carrier of the future, one crucial factor is essential: the efficiency of the plants.

Optimising plant efficiency means not only reducing costs, but also increasing performance and resource conservation along the entire value chain – from hydrogen production to storage and utilisation. Weidmüller's specialised expertise in products and certifications helps to increase your plant efficiency.

Customised certification and industrialisation for the hydrogen ramp-up

With our extensive experience in the process industry and and the certificaton of products and processes we develop safe and forward-looking solutions together.

- Certification expertise
- Approvals for hazardous areas
- Development expertise

Electrolysers and fuel cells

P. 4-9

Electrolysis is the key process in hydrogen production, whereby various technologies have been developed to meet the differents requirements of use and energy demand. From alkaline electrolysers to proton exchange membranes (PEM), anion exchange membranes (AEM) through to solid oxide electrolysis cells (SOEC), each type of electrolysis offers specific advantages. At Weidmüller we have extensive experience with all of these hydrogen technologies and offer customised solutions in electrical connectivity and automation to support efficient and reliable hydrogen production and utilisation worldwide.

More information on our website:
www.weidmueller.com/h2electrolysis

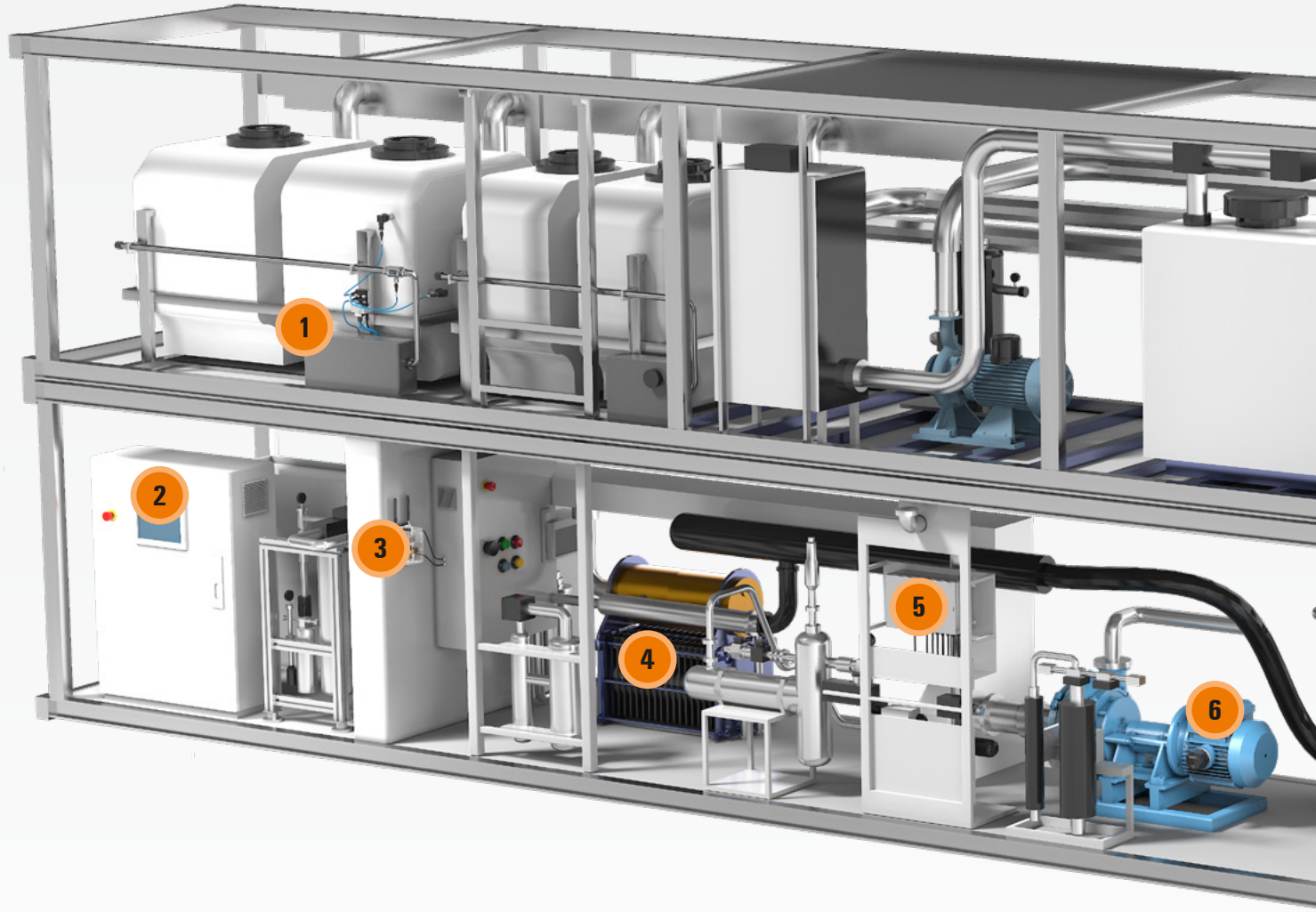
Refuelling stations and storage

P. 10-15

Hydrogen storage and refuelling stations require seamless integration of different systems, from trailer swap and compression to refrigeration, dispensers and other components. All of these components must interact flawlessly to ensure efficient and safe operation. Weidmüller's modular approach enables customers to develop fully customised connectivity and automation systems. With our flexible and scalable solutions, every aspect of the storage and refuelling process can be optimised to ensure smooth operation and easy adaptation to future requirements.

More information on our website:
www.weidmueller.com/h2refuelling

More efficiency in hydrogen production
Solutions for electrolysers



An electrolysis system consists of several interconnected modules, including transformers, rectifiers, circulation pumps, heat exchangers, stack coolers, dryers and compressors. Each of these is essential for the smooth and efficient operation of the entire process.

In addition to seamless integration, the system must be fully automated and fulfil strict safety certifications such as ATEX and SIL2/SIL3. With expertise in electrical connectivity, automation, hardware and software, Weidmüller offers comprehensive solutions for all these systems to ensure safe and efficient operation.

Cell Voltage Measurement Box

Cell voltage measurement for stacks: electrolyser, fuel cells and BESS

The Cell Voltage Measurement Box (CVM) enables the measurement of the differential voltage of individual cells in electrolysis stacks, fuel and battery cells to collect and analyse data of hydrogen systems.

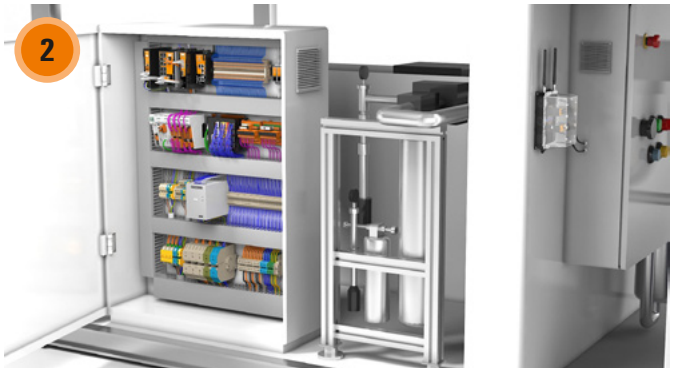
It can be used independently of the manufacturer and fulfils all requirements of the hydrogen industry, including the necessary certifications. The special feature: The box is plug-and-play ready, modular and designed for industrialisation and a rapid ramp-up of the H2 industry, electrolysers and fuel cells.

More information on our website:
www.weidmueller.com/cvm-box

Our solutions for electrolysers in detail

1. Sensor/actuator connectivity

Sensor/actuator connectivity is crucial for modern automation solutions. **Decentralised contacting** enables flexible and efficient systems that facilitate installation and maintenance. With a high level of protection, the components are optimally shielded from environmental influences, enhancing their longevity. The plug-and-play capability ensures quick integration into existing systems without extensive configurations. The **ATEX certification** for zones 1 and 2 ensures safe use in potentially explosive areas. Additionally, the M12 sensor cable connection enhances the robustness and reliability of the applications.



2. Control cabinet

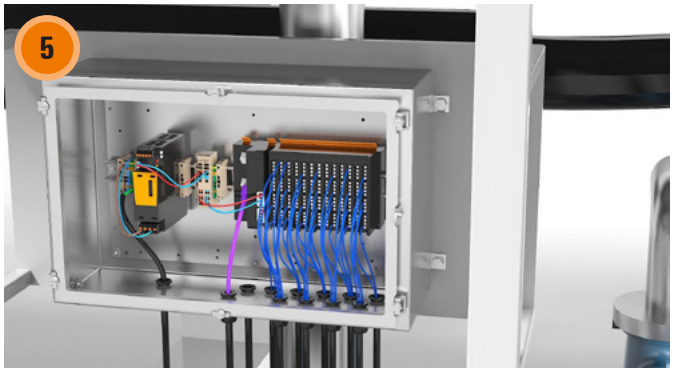
The fast delivery of individually pre-assembled, equipped and ready-to-install mounting rails and cable harnesses simplifies and accelerates the production process. In this way, our customers reduce their costs and increase their flexibility and competitiveness. With the **Weidmüller Configurator (WMC)** software, users can make individual configurations for their control cabinet.

3. Data communication

Communication for controlling systems is crucial for smooth operation. Technicians can access systems at any time via **remote maintenance**, enabling problems to be solved quickly. A Universal edge gateway with LTE/4G connection ensures stable data transmission. Node-RED is used for visual programming to manage data streams and optimise automation processes. A **security router** protects the traffic and prevents unauthorised access, which ensures efficient, secure and flexible control of industrial plants.

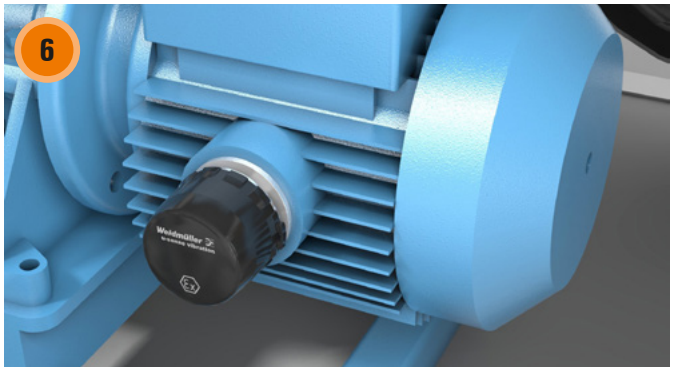
4. Contact technology for electrolysis stacks

In addition to individual contacts, customised designs are also possible. The contacts are assembled into an interface board, enabling **multiple connections** to the bipolar plates and, if necessary, fusing. The temperature-related expansion and the production tolerances of the stack must be taken into account. Compared to single contacting, the interface solution offers significant time savings and error reduction in stack production. A customised cable assembly completes the offering and prepares the analysis of cell voltages.



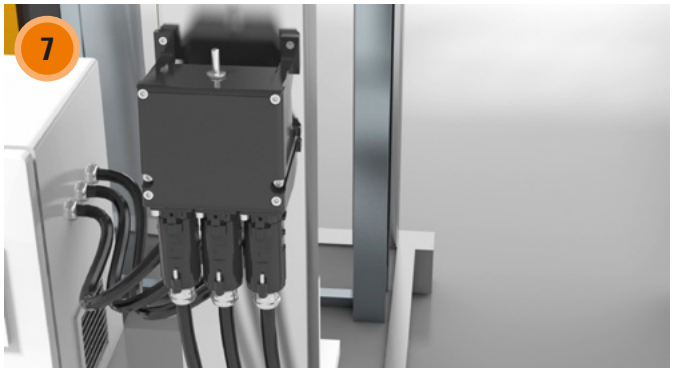
5. Data acquisition for electrolysis stacks

Ex-certified components ensure that devices and systems meet the highest safety standards. This certification guarantees data security and reliability. Thanks to modularity and scalability, our customers can flexibly adapt the data collection and efficiently integrate new technologies. The industrial quality of the components ensure a long service life and high performance, which minimises downtimes and maximises productivity. **Condition monitoring** allows for continuous machine oversight, enabling early detection and resolution of potential issues, thereby increasing operational efficiency.



6. Vibration monitoring

u-sense vibration is a compact sensor for machine condition monitoring. It was specifically designed for continuously running pumps and drives, such as those used in water treatment and compressors. Thanks to its battery supply, **wireless data transmission**, and protection in accordance with IP66 and ATEX certification, u-sense vibration is ideal for monitoring electrolysis plants. The connection is straightforward, utilising variable mounting with an M8 screw connection or adapter. Anomalies are detected promptly, enabling **preventive maintenance**.



7. High-current connector

The RockStar® HighPower modular high-current connector system has been specially developed for the transmission of high electrical power. The **modular design** consists of one-piece crimp contacts, insulating sleeves, insert holder frames and a robust, multi-part, dust and waterproof die-cast aluminium housing (IP68) and cross-connection options. The modular design offers clear advantages for handling.

8. Energy management

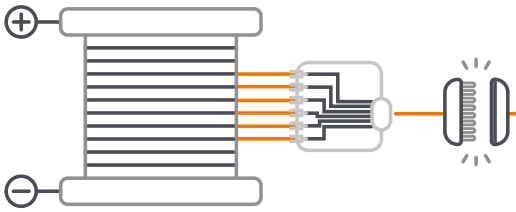
Energy management plays a central role in optimising processes and reducing costs. With ResMa®, an innovative approach to resource and energy management, companies can significantly enhance their energy efficiency. The **DIN EN ISO 50001** standard provides a structured framework for energy management. Another advantage is the ability to analyse processes easily and efficiently, particularly through the use of human-machine interfaces (HMI). These technologies enable intuitive monitoring and control of energy consumption and production.

Solution design: Stack monitoring for electrolysers and fuel cells

The stack is one of the most important components in hydrogen production and is crucial for efficiency and safety. As a pioneer in 'From data to value', Weidmüller offers end-to-end solutions from connectivity to the the cloud. Weidmüller monitors key parameters such as the total applied current and voltage, temperature, the preload force caused by disc springs and vibrations caused by compressors and pumps. By recording and analysing this data, we ensure optimised performance, early fault detection and increased operational reliability of the stack.

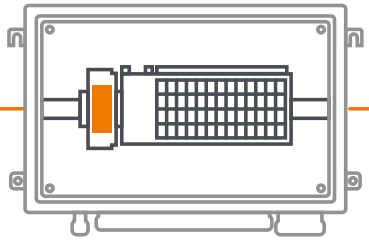
Ex Zone 1/2

Data acquisition



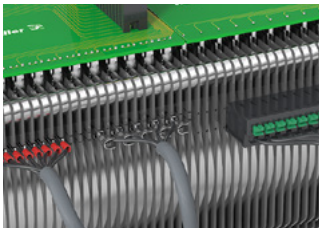
Ex Zone 1/2

Data pre-processing & control



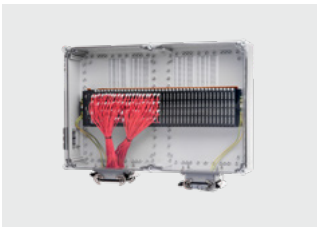
Fieldbus communication via:

ModbusTCP · EtherCAT P · PROFINET · EtherNet/IP



Individual contacting
With our wide range of contacting options we offer professional individual contacting of the bipolar plates in the stack.

Multiple contacting
In addition to single connections are also possible. The contacts are applied to the printed circuit boards so that several circuit boards can be contacted in a single plugging process. For the typical stacks of PEM electrolysis, this means a considerable time saving.



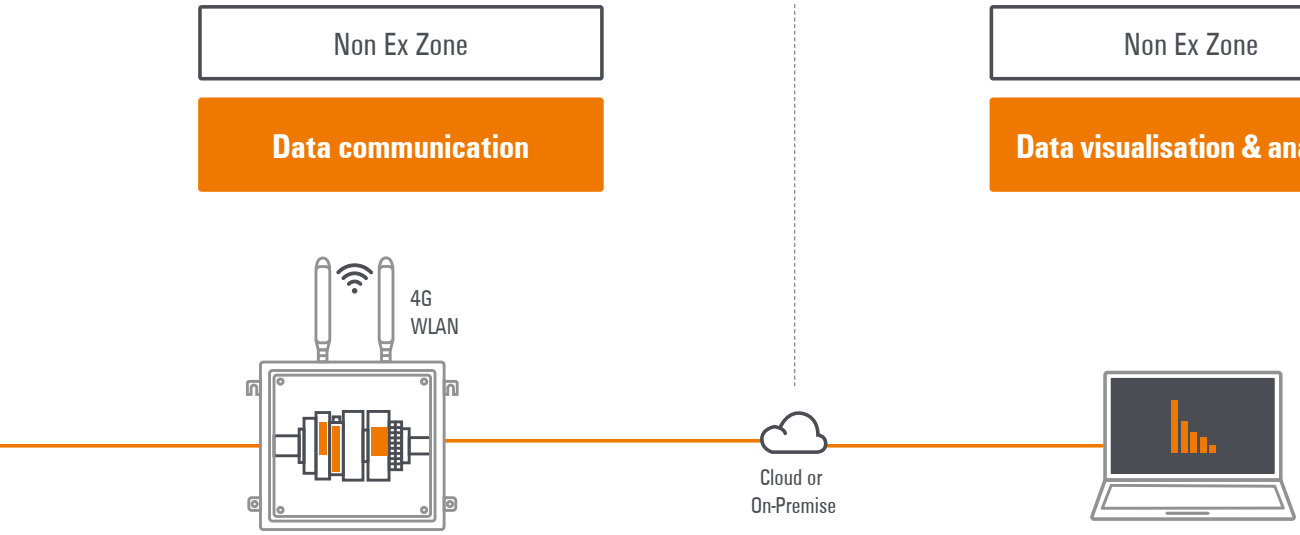
Data pre-processing
Differential voltage measurement of individual cells for data acquisition and analysis. Our CVM Box is plug-and-play, modular and suitable for industrialisation. It supports protocols such as PROFINET, EtherCAT, Modbus and many other options that are available without protocol converters are available.

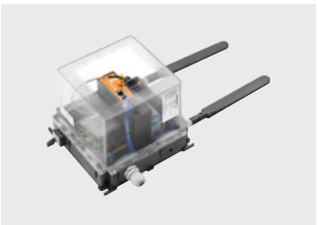
Data control
At the same time, the data acquisition of the differential voltage measurement of individual cells can be combined. With the help of the u-control product family, a large number of cell voltages can be measured and monitored. Subsequently, control functions and data analysis can be triggered.

Cell Voltage Measurement with 1500 V isulation voltage

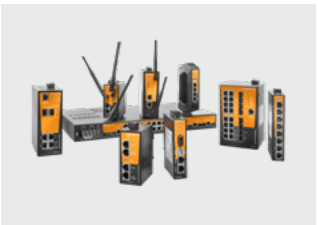
Monitoring Options

Stack voltage and current | Single cell voltage | Temperature | Preload force | Vibration





Local communication
In addition to the LAN connection, a connection via IoT boxes is also possible. This allows stationary systems to be accessed remotely.



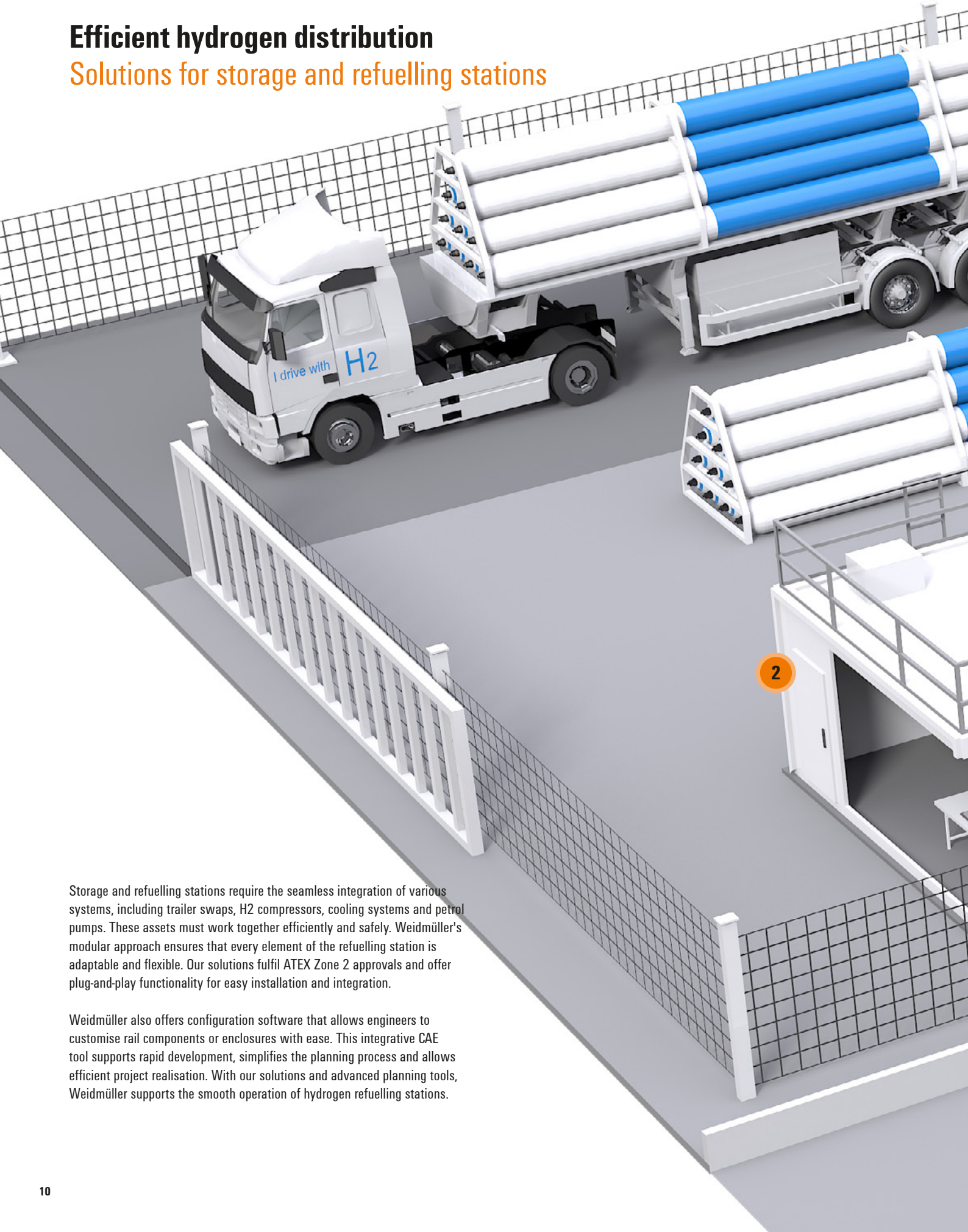
IIoT data communication
In addition to the system operator, the stack manufacturer can also access the system remotely for diagnostics, service and support. This enables preventive maintenance and maximises the operational time of the system.

Data visualisation and analysis
With our visualisation hardware u-view and software solution PROCON-WEB we enable real-time data acquisition of stacks. This allows manufacturers and operators to monitor important parameters and and recognise potential errors.

Data analysis and machine learning
Our integrated approach ensures seamless data flow from the stack to the cloud, which can be utilised for automated machine learning. The results of the AML software can be integrated into the SCADA system for predictive maintenance via OPC-UA, creating a full control loop for operators and manufacturers.

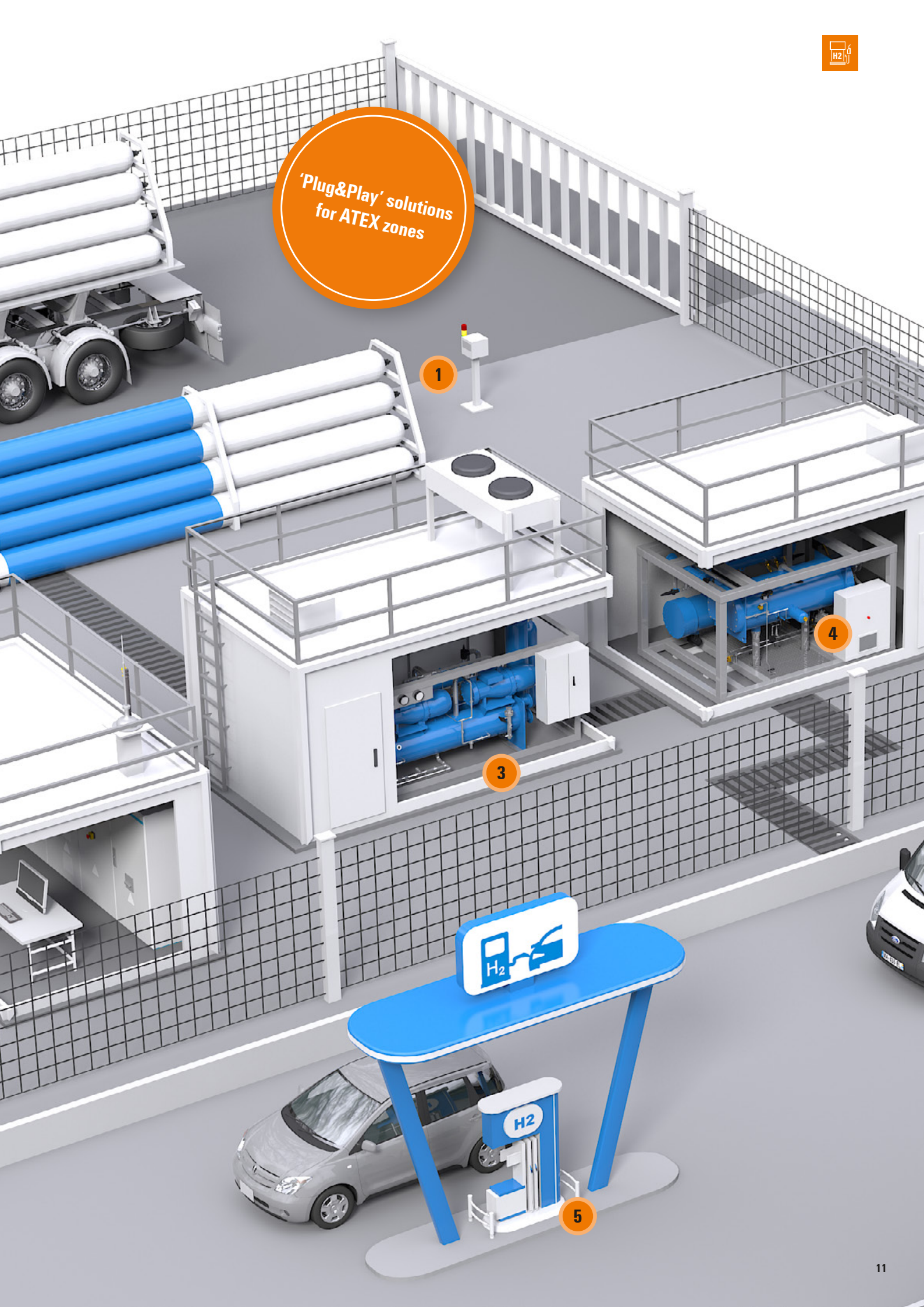
Efficient hydrogen distribution

Solutions for storage and refuelling stations

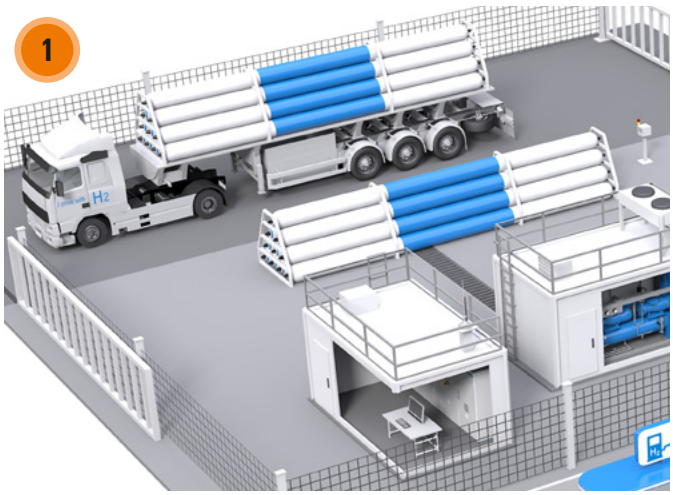


Storage and refuelling stations require the seamless integration of various systems, including trailer swaps, H2 compressors, cooling systems and petrol pumps. These assets must work together efficiently and safely. Weidmüller's modular approach ensures that every element of the refuelling station is adaptable and flexible. Our solutions fulfil ATEX Zone 2 approvals and offer plug-and-play functionality for easy installation and integration.

Weidmüller also offers configuration software that allows engineers to customise rail components or enclosures with ease. This integrative CAE tool supports rapid development, simplifies the planning process and allows efficient project realisation. With our solutions and advanced planning tools, Weidmüller supports the smooth operation of hydrogen refuelling stations.

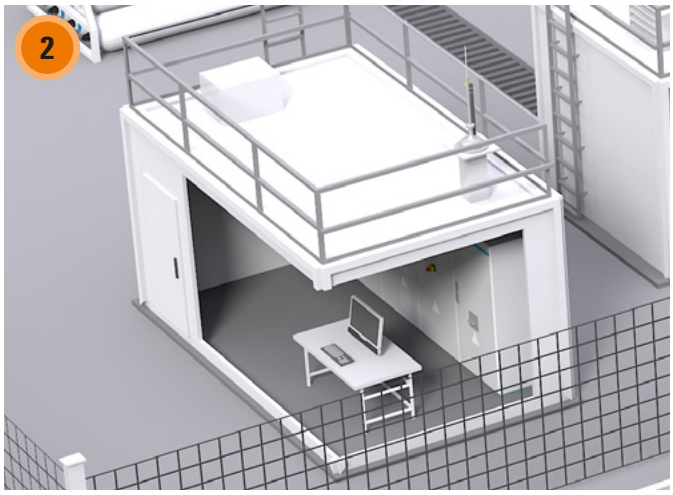

'Plug&Play' solutions for ATEX zones
1
3
4
5
H2

Our solutions for hydrogen refuelling stations in detail



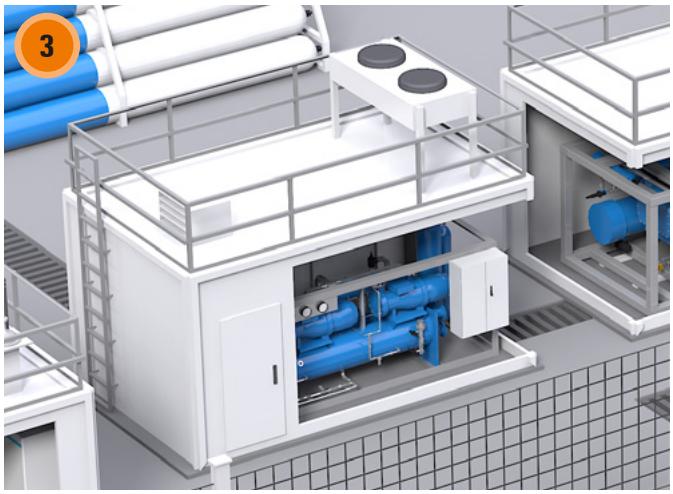
1. Storage

Important components are the **communication boxes**, which ensure reliable data transmission for the control and monitoring of storage in warehouses or trailers. An ATEX-certified heating system is required to comply with safety standards in potentially explosive areas and to regulate the temperature of the hydrogen tanks, which increases operational safety. **Heavy-duty connectors** ensure robust and safe connections between the components, while backup enclosures allow flexible adjustments to the refuelling station infrastructure to facilitate future expansions.



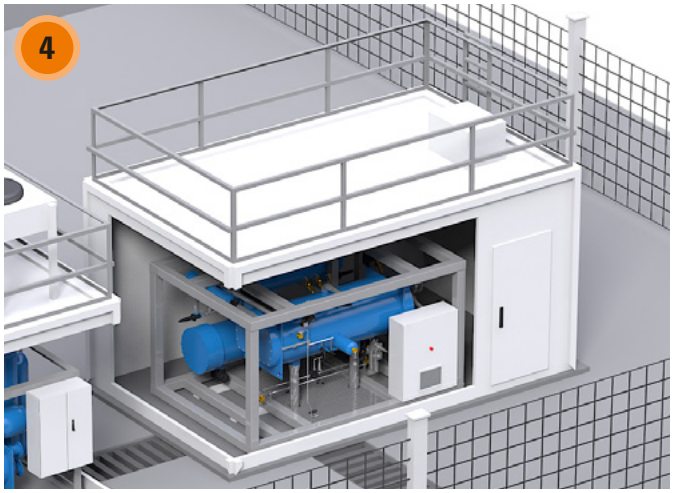
2. Control room

The control room is central to operational monitoring and control. With a **modular control unit**, operators can react flexibly to requirements and adapt the systems efficiently. Modular remote I/O systems make it easy to expand the infrastructure. A web-based **SCADA system** provides remote access, allowing operators to access data at any time, thereby shortening response times in the event of faults. **Industrial Analytics** provides valuable insights into operating data to increase efficiency and detect problems at an early stage. The ResMa® energy management system ensures optimised use of resources. Fieldbus distribution and the Industrial Ethernet portfolio guarantee robust data communication.



3. Compressor

A modular control unit enables flexible adaptation of operating parameters and integration into existing systems. **Modular remote I/O systems** ensure efficient data processing, while ATEX-certified housings guarantee safety in potentially explosive atmospheres.Intrinsically safe, analogue signal processing and HART® repeaters enable precise monitoring of the compressors. Solutions from the Industrial Ethernet portfolio offer robust data communication. Industrial Analytics provides insights into operating data to increase efficiency and early detection of problems. Relay couplers and solid state relays ensure reliable control of electrical components, while distribution boxes and junction boxes simplify cabling. **Sensor distribution blocks (Ex i)** and sensor cables ensure safe connections to the measuring systems.



4. Cooling unit

Refrigeration units are essential for the safe storage and handling of hydrogen at refuelling stations. A modular control unit enables flexible adaptation to different operating conditions. Modular remote I/O systems and a DC emergency power supply (UPS) ensure efficient monitoring and reliable operation. Our PROtop power supply with **I/O link communication** further increases operating efficiency. Electronic load monitoring protects against overloads, while relay couplers and solid-state relays ensure safe control of the electrical systems. Data communication provides real-time information to further enhances operating efficiency.

5. Refuelling

The dispenser unit in the hydrogen refuelling station is crucial for a safe and and efficient refuelling process. **Touch panels** facilitate the user-friendly monitoring and control of the entire refuelling process in real time. **Industrial PCs** play a central role in the filling unit, enabling powerful data processing and analysis. Additionally, control and signaling devices ensure precise control of the filling processes and optimal parameter settings. Another important aspect are the **safety relays**, which act as a protective mechanism. They monitor critical functions and ensure that immediate action is taken in the event of an error to safeguard users and system.

Solution design: Monitoring of hydrogen storage and refuelling

Weidmüller's technology optimises hydrogen filling stations through holistic data management solutions - from acquisition to analysis. Our innovations not only increase operational efficiency, but also ensure compliance with the highest safety standards and promote a sustainable energy future.

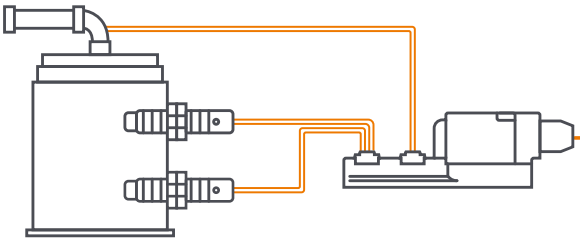
Thanks to our expertise in connectivity and automation we enable efficient and safe management of the hydrogen infrastructure.

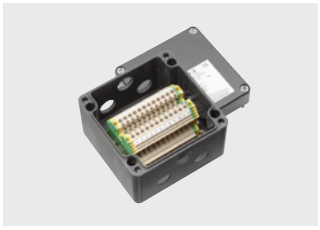
Zone 1/2

Data acquisition

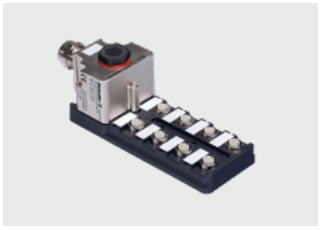
Zone 2

Data pre-processing & control





Ex-protected junction box
Hydrogen refuelling stations require different solutions for various applications. With our Klippon® installation service we provide ready-to-connect enclosure solutions for a wide range of applications, creating significant process savings, while we fulfil the highest quality and standard requirements.



Ex-protected SAI block
Various sensor information must be collected from potentially explosive hazardous areas. From sensors for flow measurement to temperature and much more. The ATEX and IECEx-certified SAI distribution box from Weidmüller is used in explosion-protected areas for the transmission of intrinsically safe circuits up to and including Zone 1.

Pre-processing of the data
All sensor information from the field can be easily collected via the u-remote series and transmitted to the control system in real time using protocols such as PROFINET, EtherCAT or others. The integrated web server also facilitates the setup of the I/O system. The u-remote system is Zone 2 Ex approved and can be integrated into Ex environment solutions.

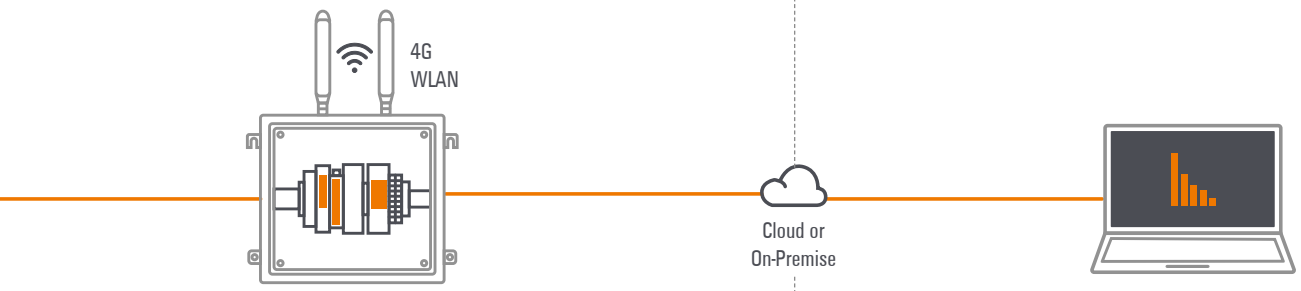
Data control
The powerful controller also functions as an edge device and provides local information on the network. It can be expanded by connecting function modules, which makes it ideal for automation and IIoT applications. Thanks to its capabilities, u-control can be used for dynamic cooling management to reduce energy consumption. All u-remote modules, such as the energy module, are supported.

Non Ex Zone

Data communication

Non Ex Zone

Data visualisation & analysis



Local Communication
Thanks to a wide range of Ethernet solutions, serial dispenser communication protocols (e.g. RS-232, RS-422, RS-485) can be converted into an Ethernet-based network. Weidmüller also offers managed and unmanaged switches for smooth communication. This enables reliable and flexible transmission of data between devices such as compressors, cooling systems or storage tanks in the network.

Cloud Communication
Remote access is one of the most important aspects for security. Thanks to the integrated firewall and VPN technology, secure data communication via the Weidmüller security router is possible. The router meets the required certifications and standards for hydrogen refuelling stations.

Data analysis with ResMa®
ResMa® is the Weidmüller resource management software. It can be easily integrated into refuelling stations to enable simple data collection from different dispensers and systems as well as the collection of production data. This data can be used to calculate the amount of H2 or to determine the energy consumption of devices such as compressors and cooling units.

Data management and AutoML
The data from the PLC can be directly fed into the PROCON-WEB SCADA system. Third-party data, such as weather forecasts, can be easily integrated to predict scenarios and ensure the smooth operation of the system. Weidmüller AutoML is used for preventive maintenance and quality assurance.

Imprint: Weidmüller Interface GmbH & Co. KG, Klingenbergstraße 26, 32756 Detmold, Tel.: +49 5231 14280, E-Mail: weidmueller@weidmueller.de, www.weidmueller.de | Limited partnership (KG), Registered office: Detmold, Register court Lemgo HRA 2790 | General partner: Weidmüller Führungsgesellschaft mbH, Registered office: Detmold, Register court Lemgo HRB 3924, VAT ID no.: DE124599660 | Corporate Executive Management: Dr. Sebastian Durst, Dr. Timo Berger, André Sombecki, Dr. Christian von Toll

Weidmüller – Your partner in Smart Industrial Connectivity

As experienced experts we support our customers and partners around the world with products, solutions and services in the industrial environment of power, signal and data. We are at home in their industries and markets and know the technological challenges of tomorrow. We are therefore continuously developing innovative, sustainable and useful solutions for their individual needs. Together we set standards in Smart Industrial Connectivity.

Made in Germany

Weidmüller Interface GmbH & Co. KG
Klingenbergstraße 26
32758 Detmold, Germany
T +49 5231 14-0
F +49 5231 14-292083
www.weidmueller.com

Personal support can
be found on our website:
www.weidmueller.com/contact

03/2025/SMM