BLAKEBOROUGH® CONTROL VALVE FOR HYDROGEN SERVICE

TRILLIUM FLOW TECHNOLOGIES™

TRILLIUMFLOW.COM

TÜV SÜD-CERTIFIED CONTROL VALVES FOR HYDROGEN SERVICE

In the rapidly evolving landscape of energy transition, hydrogen is emerging as a key player in achieving net-zero carbon goals. It is essential to utilize advanced and reliable solutions for process applications when handling hydrogen, whether during its production, transportation, or storage.

Valves play a crucial role in emission control and process optimization. They help industries in transitioning to cleaner energy solutions, supporting carbon capture and storage (CCS) initiatives, and maintaining operational integrity, all of which are critical for achieving a net-zero carbon future. Consequently, valves must not only be reliable but also secure enough to address the unique challenges associated with hydrogen and CCS applications.

At Trillium Flow Technologies™, our mission is to deliver performance-engineered valves that ensure safe, reliable, and efficient hydrogen processing, contributing significantly to the success of energy transition initiatives. Our expertise in designing, manufacturing, and servicing critical valves for the process industry makes us a leader in providing effective solutions for hydrogen applications. Our valves are engineered to enhance operational efficiency and maximize profitability throughout the entire lifecycle of your hydrogen systems.

With years of experience, particularly through our Blakeborough® range of valves, we have successfully supported numerous hydrogen production plants around the world. Our products are specifically designed to offer cost-effective solutions for managing hydrogen, addressing its unique handling requirements with precision.

Trillium's Blakeborough® control valves have been qualified by TÜV SÜD for industrial hydrogen applications, ensuring that our valves not only meet but exceed the stringent requirements of both national and international regulations.

The qualification program is followed by a rigorous and comprehensive factory audit, designed to confirm that Trillium's quality management system is fully equipped to address the requirements of emerging technologies. This audit evaluates the factory's adherence to essential standards in critical areas such as production control and monitoring, supply chain and material management, product verification and testing, and documentation practices. Through this process, our factory's ability to design, manufacture, and test valves for hydrogen service in industrial applications is thoroughly validated.

By achieving TÜV SÜD qualification, we provide our customers with the assurance that our valves are engineered to the highest standards, making them a reliable choice for hydrogen production, transportation, and storage. This recognition further solidifies our position as a trusted partner in the energy transition, offering solutions that prioritize safety, efficiency, and regulatory compliance.

THE HYDROGEN VALUE CHAIN

Hydrogen's distinctive properties make it a vital catalyst for the decarbonization of various sectors. The declining costs of renewable energy render hydrogen an ideal solution for converting power into different energy forms, including:

1. Power-to-Gas: Excess renewable electricity, such as wind or solar power, can be converted into hydrogen through electrolysis. This hydrogen can then be injected into natural gas pipelines or stored for later use, helping to stabilize energy grids.

2. Power-to-Liquid Fuels: Hydrogen can be combined with carbon dioxide to produce synthetic fuels, such as methanol or aviation fuel. This results in a sustainable alternative for sectors that are difficult to electrify, like aviation and heavy-duty transport.

3. Power-to-Heat: Hydrogen can be used directly as a fuel for combustion to generate heat in industrial processes, such as steel and cement production, where high temperatures are needed and electrification is less efficient.

4. Power-to-Ammonia: Hydrogen can be combined with nitrogen to produce ammonia, which is widely used as a fertilizer in agriculture. It can also be utilized as a carbon-free fuel for shipping and energy storage.

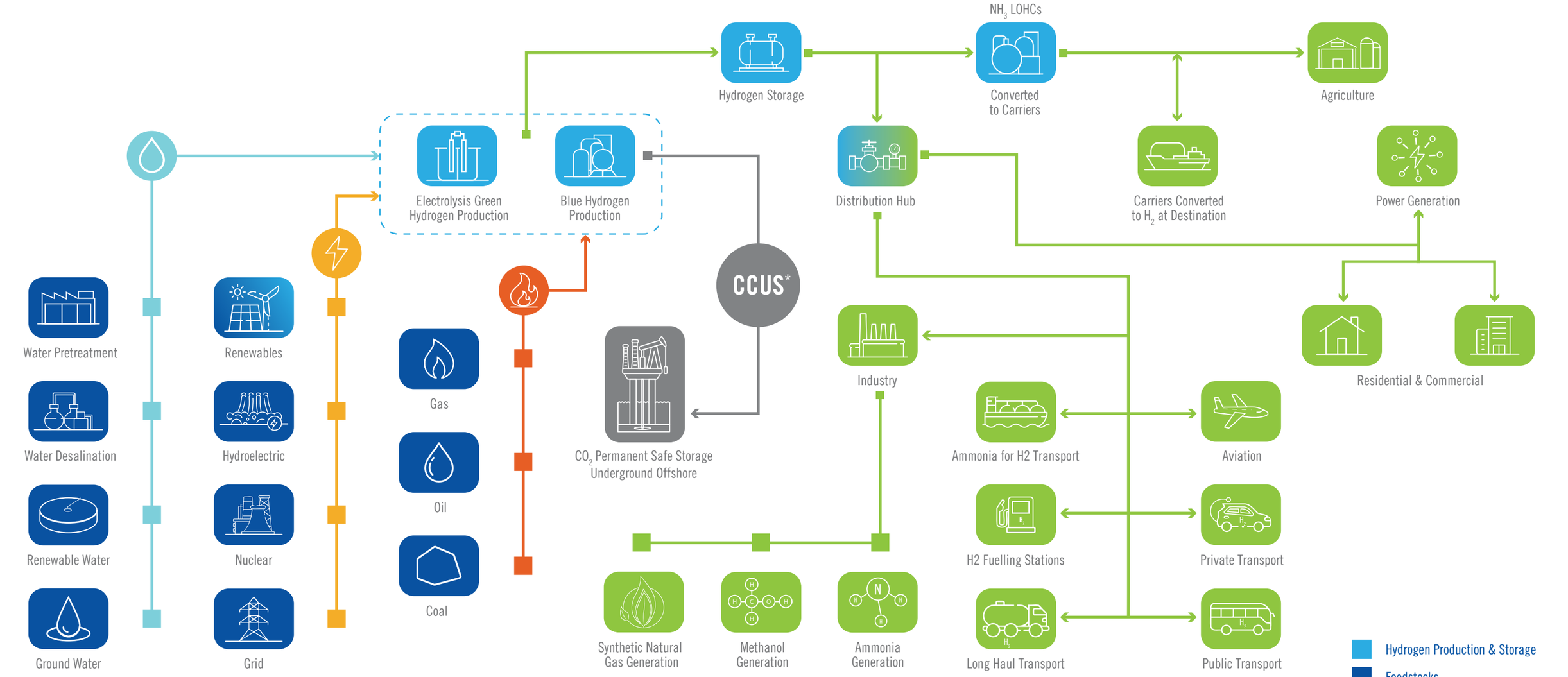
5. Power-to-Electricity (Fuel Cells): Stored hydrogen can be converted back into electricity using fuel cells, providing a reliable backup power source or off-grid power for remote locations.

6. Fuel for Long-Distance Transport: Due to its compact form, liquefied hydrogen is easier to transport over long distances, whether by specialized tankers, ships, or pipelines. This is especially beneficial for regions without local hydrogen production capabilities that need to import hydrogen.

7. Fuelling Infrastructure for Heavy-Duty Vehicles: Liquefied hydrogen presents a promising fuel source in transport sectors such as trucking, rail, shipping, and aviation. For heavy-duty vehicles and ships, it can serve as a low-emission alternative to diesel or marine fuels, providing longer ranges and faster refuelling times compared to gaseous hydrogen.

8. Energy Storage: Liquefied hydrogen can store large quantities of renewable energy for extended periods. This is advantageous for balancing the grid, as it allows surplus energy from sources like wind or solar to be converted into hydrogen, liquefied, and stored until demand increases.

9. Industrial Applications: Liquefied hydrogen is used in industries requiring large amounts of hydrogen but facing space constraints, such as steelmaking, refining, and chemical production. In these industries, liquefied hydrogen is valued for its purity and energy density.



(*) CCUS = Carbon Capture, Utilization and Storage

CONTROL VALVES FOR HYDROGEN APPLICATIONS

Blakeborough® BV500 control valves are a robust and reliable choice for hydrogen applications, offering unparalleled safety, durability, and compliance with stringent international standards.

Fugitive Emission Classification: The valve design is classified under ISO 15848-1, meeting the Class A stem leakage requirement for CO1 and CC1 endurance, ensuring superior durability and longevity in demanding hydrogen applications. The testing was conducted with 99.9% pure hydrogen at cryogenic and ambient temperatures proving the suitability of the design and material of construction for the demanding hydrogen applications

Leakage Testing: Both valve function and internal/external leakage are rigorously tested in accordance with BS6364, BS EN IEC 60534-4 Class VI, and ISO19880-3 standards. This ensures optimal performance and safety under various operating conditions.

Material Compatibility Testing:

- **Metallic Materials:** These materials undergo 99.9% hydrogen compatibility testing at both ambient and cryogenic temperatures, ensuring reliable performance across a wide temperature range.
- **Elastomeric Sealing Materials:** Rigorous testing is conducted for elastomeric sealing materials, verifying their compatibility with 99.9% hydrogen at both ambient and cryogenic temperatures.
- **Thermoplastic Materials:** These materials are also tested for 99.9% hydrogen compatibility at ambient and cryogenic temperatures, further ensuring the valve's resilience and reliability.

KEY FEATURES

VALVE DESIGN	Globe Control Valve
VALVE SIZE	1” to 8”
PRESSURE RATING	Class 150 and Class 300
BODY DESIGN	• Forged • Cast
END CONNECTION	• Flanged • Butt-weld • Threaded
TRIM STYLE	Full range available to suit the flow conditions
OPERATOR	• Manual • Pneumatic actuation • Electric
OPERTING TEMPERATURE	-253˚C (-423˚F) to 250˚C (482˚F)
ASSEMBLY CONFIGURATIONS	• Extended bonnet/stem per BS 6364 • Custom extended bonnets/stems / drip trays available • Cold box requirements
MATERIAL TESTING METALLIC AND NON-METALLIC RGD QUALIFICATION	Per TUV specifications – 99.9% H2 exposure at cryogenic (-196ºC) and ambient temperature at design pressure
TÜV QUALIFICATION - SHELL AND SEAT LEAKAGE COMPLIANCE WITH 99.9% HYDROGEN GAS AT CRYOGENIC (-196ºC) AND AMBIENT TEMPERATURE	BS EN IEC 60534-4 ISO 19880-3
TÜV QUALIFICATION - STEM LEAKAGE COMPLIANCE WITH 99.9% HYDROGEN GAS AT CRYOGENIC (-196ºC) AND AMBIENT TEMPERATURE	ISO 15848-1 Class A CO1 ISO 15848-1 Class A CC1
TYPICAL APPLICATIONS	• Production – Purification (PSA) - Purge Supply Control • Production – Purification (PSA) – Repressurization Control • Transfer and Storage of Hydrogen Gas • Liquification – Gas Compression – Feed Gas Control • Liquification – Pre-Cooling– Joule Thompson, Multistage Letdown • Hydrogen Fuels • Gas Dehydrogenation • Underground Injection/Withdraw Trillium can provide custom solutions to meet specific process requirements.

ZERTIFIKAT ◆ CERTIFICATE ◆ 認證證書 ◆ CERTIFICADO ◆ СЕРТИФИКАТ ◆ CERTIFICAT

TÜV SÜD
Product Service

CERTIFICATE

No. Z2 128458 0001 Rev. 01

Holder of Certificate: **Trillium Flow Technologies UK Ltd**
Britannia House, Huddersfield Road
Elland, Calderdale HX5 9JR
UNITED KINGDOM

Certification Mark:

Safety tested · Production monitored · TÜV SÜD · Hydrogen system component

Product: **Valve**
Blakeborough - Hydrogen Flow Control Valve

The product was tested on a voluntary basis and complies with the essential requirements. The certification mark shown above can be affixed on the product. It is not permitted to alter the certification mark in any way. In addition, the certification holder must not transfer the certificate to third parties. This certificate is valid until the listed date, unless it is cancelled earlier. All applicable requirements of the Testing, Certification, Validation and Verification Regulations of TÜV SÜD Group have to be complied. For details see: www.tuvsud.com/ps-cert

Test report no.: ar713308057_05
0713308057TRF_PPP_52386B_2024

Valid until: 2029-12-11
Date, 2025-02-06

(Uwe Becker)

TÜV SÜD Product Service GmbH • Certification Body • Ridlerstraße 65 • 80339 Munich • Germany

TÜV®

TRILLIUM
FLOW TECHNOLOGIES™

TRILLIUM FLOW TECHNOLOGIES UK LTD

Britannia House, Huddersfield Rd,
Elland, HX5 9JR, United Kingdom
Tel. +44 (0) 1422 282000
Fax. +44 (0) 1422 282100
Email: info@trilliumflow.com

TRILLIUMFLOW.COM