grz: TECHNOLOGIES

DASH C-SERIES

SOLID-STATE HYDROGEN STORAGE MODULES

- PLUG-AND-PLAY
- SAFE
- HIGH-CAPACITY

POWERING THE FUTURE OF HYDROGEN STORAGE

APPLICATION #1

The DASH C-Series hydrogen storage systems are designed to ensure continuous hydrogen access to industrial customer thanks to its modular, scalable, and low-maintenance setup.

UNLOCK THE POWER OF SOLID-STATE HYDROGEN

The 'C' in our DASH C-Series stands for Containerized: a plug-and-play hydrogen storage system complete with all essential systems.

APPLICATION #1: STORAGE OF FLUCTUATING HYDROGEN PRODUCTION

As the shift towards green hydrogen production is advancing, hydrogen storage capabilities at production sites become crucial. This is the key enabler to a 100% green hydrogen production, decoupling the production profile with the needs from downstream users. The DASH C-Series bridges production and consumption needs.

PARAMETER	BASIC SOLUTION: COMPRESSED H_2 (200 BAR)	GRZ SOLUTION: DASH C-SERIES H_2 STORAGE
Storage Capacity	675 kg H_2	675 kg H_2
Pressure	High (200 bar)	Low (< 45 bar)
Safety Concept	High pressure increases risks, requiring costly safety measures	Superior safety through low-pressure, solid-state technology
Footprint [1]	> 100 m²	15 m²
Scalability	Limited by footprint and safety requirements	Modular and easily scalable
Maintenance	High maintenance due to compressors and frequent high-pressure testing	Minimal due to no moving parts and low pressure
Levelized Costs of Hydrogen Storage [2]	0.69€/kg H_2	0.38€/kg H_2

[1] *Considering a conventional trailer with a capacity of 225 kg H_2 and a length of 12.5 m; without considering the safety distance and other constraints.*
[2] *Considering a lifetime of 20 years, cost of capital 4%/y, costs of hydrogen compression of € 0.55/kg H_2, operation 365 days per year.*

APPLICATION #2: BUFFER STORAGE FOR INDUSTRIAL HYDROGEN CONSUMERS

The DASH C-Series solutions provide a safe, high-density supply of hydrogen, with typical applications including:

STEEL MANUFACTURING

Enables decarbonization through hydrogen integration.

CHEMICAL PROCESSES

Powers hydrogenation reactions with hydrogen.

INDUSTRIAL FURNACES

Switches operations to carbon-free fuel options (e.g., green hydrogen).

GENERAL INDUSTRIAL USE

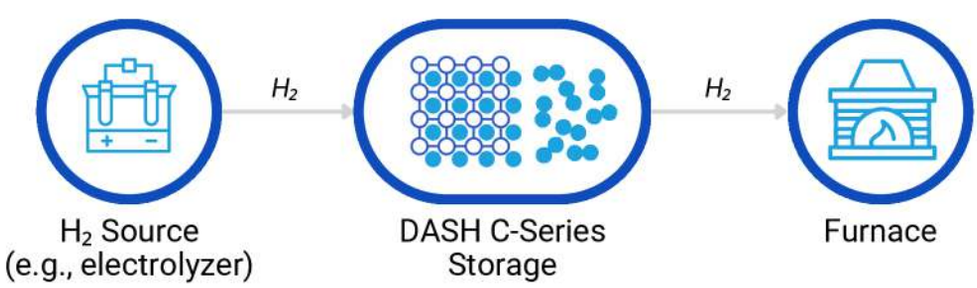
Supports any on-site hydrogen-consuming process.

PARAMETER	BASIC SOLUTION: H_2 TUBE TRAILERS (200 BAR)	GRZ SOLUTION: DASH C-SERIES H_2 STORAGE
Storage Capacity	1350 kg H_2	1350 kg H_2
Safety Concept	Fire Detectors, Protection Walls and ATEX Zones Required	Simple Implementation
Footprint [1]	200 m²	30 m²
Levelized Costs of Hydrogen Storage [2]	0.69€/kg H_2	0.38€/kg H_2

[1] *Considering a conventional trailer with a capacity of 225 kg H_2 and a length of 12.5 m; without considering the safety distance and other constraints.*
[2] *Considering a lifetime of 20 years, cost of capital 4%/y, costs of hydrogen compression of 0.55€/kg H_2, operation 365 days per year.*

APPLICATION #2

EXAMPLE APPLICATION FOR INDUSTRIAL FURNACES



CASE STUDY: GRUYÈRE HYDROGEN POWER

GHP'S ON-DEMAND INDUSTRIAL BUFFER STORAGE

Gruyère Hydrogen Power SA (GHP), based in Bulle, Switzerland, has launched a pioneering hydrogen production project powered by renewable energy, primarily biomass and solar. To enable safe, on-demand green hydrogen storage, GHP partnered with GRZ to integrate the DASH C-Series system, engineered for industrial and mobility applications.

KEY DETAILS

GHP
GRUYÈRE HYDROGEN POWER SA

CLIENT	GHP (Gruyère Hydrogen Power SA)
LOCATION	Bulle, Switzerland
PROJECT TYPE	Industrial Hydrogen Buffer Storage
PRODUCT USED	DASH C-Series 200 kg H_2

CHALLENGE

GHP required a hydrogen storage solution that would support its green energy goals, seamlessly integrate with existing infrastructure, and meet the demands of high-frequency industrial usage. Ensuring a safe, steady hydrogen supply, without extensive maintenance, was crucial for fueling a variety of industrial applications.

SOLUTION

GRZ delivered a tailored DASH C-Series system with 200 kg H_2 capacity, absorbing hydrogen directly from the electrolyzer to avoid high-pressure compressors. This compact, low-pressure solution reduces operational costs while supporting GHP's sustainable energy use, ensuring a safe and efficient hydrogen supply for various industrial applications.

BENEFITS

The DASH C-Series has provided GHP with a dependable, cost-efficient storage solution that optimizes renewable energy use, lowers operational costs by eliminating high-pressure compressors, and scales easily to meet expanding hydrogen demands.

KEY FEATURES

DASH hydrogen storage modules are patented, solid-state systems designed to provide a safe, efficient, and sustainable solution for hydrogen storage. Utilizing advanced metal hydride technology, these modules excel in various applications, offering a range of benefits:

LOW FOOTPRINT, HIGH DENSITY

With a storage capacity of up to 675 kg H_2 in a footprint as small as 15 m^2, the C-Series offers unbeatable storage densities.

MODULAR DESIGN

The system's modular nature easily adapts to growing demands, ensuring users can expand capacity as needed.

NO COMPRESSION REQUIRED

DASH C eliminates the need for costly hydrogen compressors, simplifying installation and reducing infrastructure requirements.

LOW LEVELIZED COST OF STORAGE (LCOS)

With no need for costly compression or liquefaction, DASH C offers an attractive levelized cost of storage, ensuring both efficiency and affordability over its lifecycle.

LONG SERVICE LIFE

Built for durability, DASH C systems provide over 20 years of reliable service with minimal performance degradation.

LOW OPERATIONAL EXPENDITURE (OPEX)

With fewer moving parts and no need for compression, DASH C significantly reduces maintenance costs and extends system lifespan.

LOW EMISSIONS

DASH C operates emission-free, making it a sustainable choice for hydrogen storage.

SUPERIOR SAFETY STANDARDS

DASH C's solid-state, low-pressure design ensures safe hydrogen storage, even in sensitive environments such as residential buildings or industrial sites.

DASH C-SERIES COLLECTION

The DASH C-Series sets a new standard for industrial hydrogen storage, providing a compact, solid-state solution. Built for seamless integration, each system offers plug-and-play convenience, incorporating essential auxiliary systems in a containerized format. This flexible and scalable approach allows industries to store high-density hydrogen safely—ideal for on-site use, buffering fluctuating production, or supporting industrial processes.

EXTERIOR VIEW

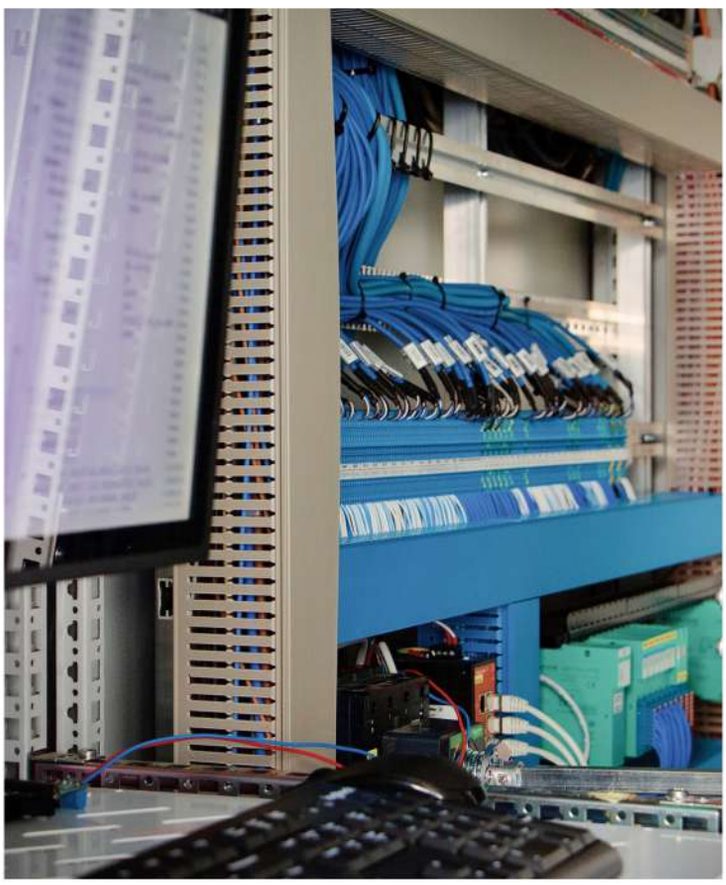
The DASH C-Series is designed for practicality and durability. The standardized 20-foot ISO container ensures easy transportation and compatibility with industrial operations, while robust construction provides long-lasting performance in diverse environments.

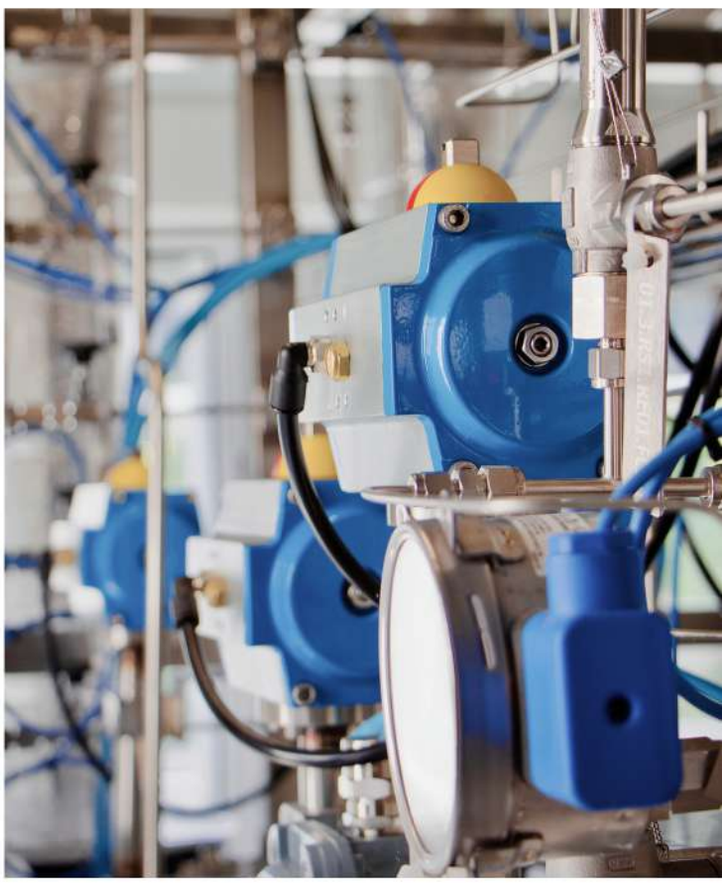
Discover the DASH C-Series product range—with eight different storage capacities, these modules are designed to optimize space, elevate safety, and simplify hydrogen storage to meet your specific needs.

DASH C STORAGE	UNIT	C45	C90	C135	C180	C270	C405	C540	C675
Hydrogen Storage Capacity	kg H_2	45	90	135	180	270	405	540	675
Nominal Outflow Rate [1]	kg H_2/h	2	4	8	8	8	8	8	8
Nominal Inflow Rate [1]	kg H_2/h	2	4	8	8	8	8	8	8
Weight	tons	10.4	14.9	19.4	23.9	32.9	46.4	59.9	73.4
Dimensions Container	feet	20	20	20	20	20	20	20	20
Electrical Interface	V AC	1-phase 230	3-phase 400	3-phase 400	3-phase 400	3-phase 400	3-phase 400	3-phase 400	3-phase 400
ATEX zones		Only at exhaust of vent lines							
Admissible Ambient Temperature	°C	-5 to +38							
Hydrogen Supply Purity	%	99.995							
Hydrogen Charging Pressure	bar(g)	30 to 45							
Hydrogen Discharging Pressure	bar(g)	1 to 45 [2]							
Expected Service Life	years	> 20							

[1] *Depending on Thermal Management System (TMS)*
[2] *With our TMS; can be customized for high flow rates*

OPTIONAL ADD-ONS





OPTIONAL ADD-ONS

The DASH C-Series offers a range of optional enhancements designed to optimize performance across diverse environments and applications:

PRESSURE TRANSMITTER

Monitors real-time hydrogen pressure for optimal operation and safety.

IN-STREAM HYDROGEN TEMPERATURE SENSOR

Measures hydrogen temperature.

BI-DIRECTIONAL MASS FLOW METER

Tracks hydrogen inflow/outflow.

FIRE AND SMOKE DETECTOR

Detects fire and smoke with both audible and visual alarms for enhanced safety.

LIQUID THERMAL MANAGEMENT SYSTEM (TMS)

Optimizes flow rates and desorption pressure based on available thermal power and temperature.

Note: Not available for models C405, C540, and C675.

LIGHTNING PROTECTION

Provides robust lightning protection for the container to ensure secure operation.

TECHNICAL SERVICES

Our comprehensive support offerings are designed to keep your DASH C-Series system running reliably and efficiently:

ON-SITE ASSISTANCE

Expert assistance during setup for optimal system functionality.

TECHNICAL SUPPORT

Available remotely or on-site for troubleshooting and preventative maintenance.

SPARE PARTS WARRANTY

Maintain system reliability with warranty coverage for essential spare parts.

WARRANTY EXTENSION

Extend warranty coverage annually when paired with our technical support.

COMPLIANCE

Every DASH C-Series system is based on the strict quality requirements of GRZ with certifications that meet international safety and performance standards:

CE CERTIFICATION

Compliance with European safety, health, and environmental standards.

ATEX DIRECTIVE 2014/34/EU

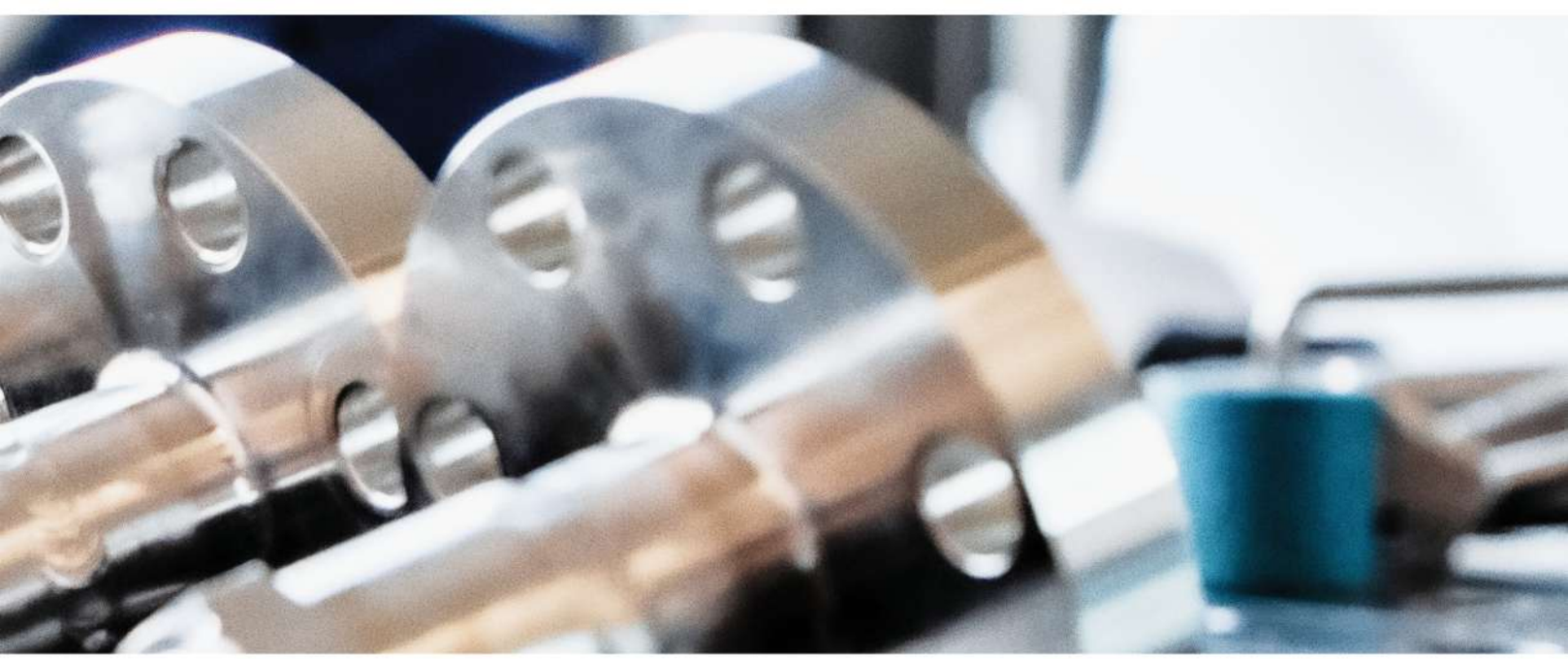
Certified for safe use in potentially explosive environments.

PRESSURE EQUIPMENT DIRECTIVE 2014/68/EU

Guarantees safe design and manufacturing of pressure equipment.

LOW VOLTAGE DIRECTIVE 2014/35/EU

Ensures electrical equipment meets safety requirements for low voltage operation.



OPERATIONAL OVERVIEW

DASH hydrogen storage modules safely and efficiently store hydrogen using advanced metal hydride technology. This proprietary method absorbs hydrogen in solid form, providing long-term stability and security.

1

HYDROGEN PRODUCTION AND ABSORPTION

Hydrogen is generated via electrolysis from renewable sources and absorbed into solid-state metal hydrides for secure storage.

SOLID-STATE STORAGE TECHNOLOGY

Hydrogen is stored in its atomic form within a metal matrix, allowing for low-pressure storage that eliminates the risks associated with high-pressure systems.

2

3

LONG-TERM STABILITY

The stored hydrogen remains stable for extended periods without leakage or self-discharge.

HYDROGEN RELEASED FOR USE

When needed, hydrogen is released from the metal hydrides and converted back into gas for various applications, including industrial use, energy production, or refueling.

4

5

OPTIONAL THERMAL MANAGEMENT

While the system operates passively, optional thermal management features can optimize hydrogen flow by regulating temperature, enhancing efficiency.

ABOUT GRZ TECHNOLOGIES

At GRZ Technologies, we stand at the forefront of hydrogen storage innovation, dedicated to reshaping the future of clean energy through our patented metal hydride technology. With decades of research and development, we deliver safe, efficient, and high-density hydrogen storage solutions for diverse applications, from residential use to large-scale applications.

PARTNERSHIPS

Our partnerships with industry leaders like Hyundai, AMPO, Sabanci, and the fischer group propel us forward, enabling advancements in backup power and renewable energy integration—all while prioritizing reliability and cost-efficiency.

A WORLD FUELED BY RENEWABLE ENERGY – DAY AND NIGHT, SUMMER AND WINTER.

Fueled by a passion for a sustainable energy future, GRZ Technologies is not just innovating; we are revolutionizing the storage and utilization of hydrogen, setting new benchmarks for excellence in the industry.

CONTACT US TODAY AND BE PART OF THE CLEAN ENERGY REVOLUTION

EMAIL

sales@grz-technologies.com

WEBSITE

www.grz-technologies.com

PHONE

+41 26 475 20 11

ADDRESS

Route de la Plaine 47,
CH-1580 Avenches, Switzerland

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