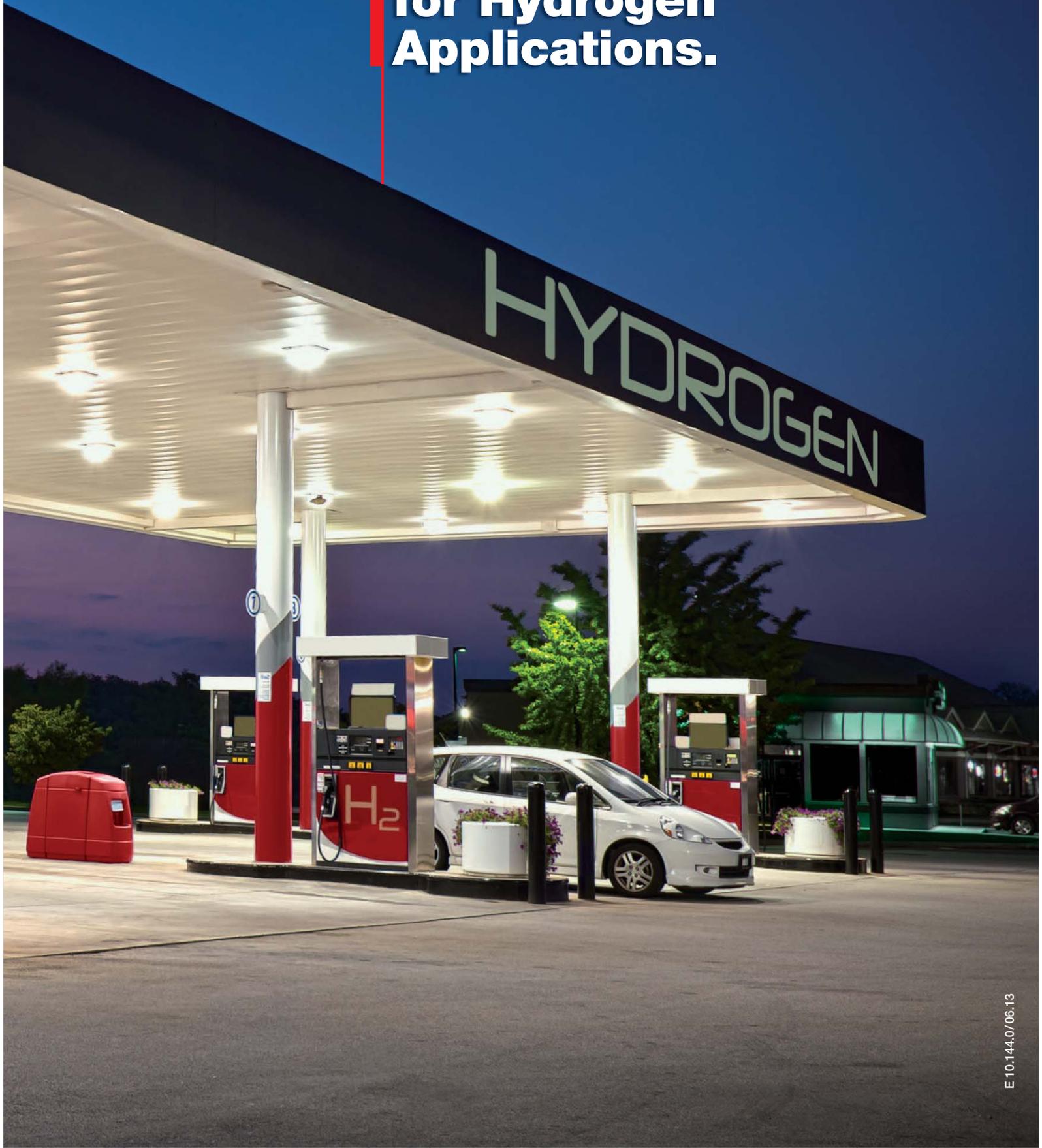


HYDAC

INTERNATIONAL

**Components,
Systems and Service
for Hydrogen
Applications.**



Components, Systems and Service for Hydrogen Applications.

The European Union has committed to transform their transport and energy systems into low carbon systems and the decoupling of economic growth from resource and energy consumption up to the year 2050. In combination with a fuel cell, hydrogen offers a secure energy supply, which is flexible, decentralized and available without emissions and hence, provides a key technology to achieve these goals.

Especially in the automotive industry, as an alternative fuel, hydrogen is becoming increasingly important. The purity of hydrogen is of extraordinary importance for the life of fuel cell-powered vehicles. To determine the pollution of the gas at 700 bar hydrogen fuel stations, the development of sampling equipment was forced, which enables the measurement of the hydrogen quality in respect to particulate contamination directly at the point of refueling.

After the launch of the PSA-H70, the sampling device to check the hydrogen cleanliness at 700 bar hydrogen fuel stations developed by HYDAC Accessories, conspicuously high particulate pollutions were detected at all sampled gas stations regardless of the compressor concept and fuel station manufacturer.

The results showed the urgent requirement to provide a reliable and sustainable filtration solution especially developed for the needs of 700 bar hydrogen fuel stations.

During development of a gas filter specifically for hydrogen fuel stations up to 1,000 bar, HYDAC Process Technology could come back on sound knowledge and experience from the field of seal gas filtration. With the GF1, HYDAC is offering a new filter technology in respect of particle retention, pressure stability and service life to ensure the technical cleanliness of hydrogen fuel stations.

All filter elements consists of stainless steel pleated filter media, which determine the precise separation rate and the high dirt-holding capacity and therefore, the GF1 meets the high requirements of 700 bar hydrogen fuel stations for the first time.

Note:

The information in this brochure relates to the operating conditions and applications described. For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

Fuel cells live longer with clean hydrogen

Hydrogen technology is being rolled out across the world. Especially in the automotive industry, as an alternative energy source, hydrogen becomes more and more important.

With the Particle Sampling Adapter PSA-H70 and the Gas Filter GF1 HYDAC established two products for the infrastructure of 700 bar hydrogen fuel stations and thus provides a significant contribution to enhance the technical cleanliness at the stations.

HYDAC PSA-H70 – Particle Sampling Adapter

The PSA-H70 is a sampling device to check the technical cleanliness of 700 bar hydrogen fuel stations directly at the point of refueling. The PSA sampling procedure becomes more and more standard as automotive manufacturers and fuel station providers are using the device to check the quality of hydrogen after start-up and maintenance intervals at the stations.

The PSA is easy to use and gives an immediate and decent indication about the situation at site. In addition to this, HYDAC offers a sampling and analysis service to support our customers as best as possible.

HYDAC GF1 with HYDAC Chemicon® – High Pressure Filter with Stainless Steel Filter Element

The HYDAC GF1 filtration concept is the latest filtration technology for 700 bar hydrogen fuel stations. Due to the combination of application optimized filter housing design and unique filter element technology, the GF1 offers outstanding robustness, process stability, integrity and permeate quality to meet the high standards of 700 bar hydrogen fuel stations.

HYDAC – your reliable Partner for Hydrogen Applications

Besides the hydrogen infrastructure market where HYDAC delivers turn-key hydraulic and cooling aggregates additionally, the widely spread product portfolio of HYDAC provides a lot more options for the use in hydrogen applications: coolers for pre-cooling of the hydrogen, hydraulic units, sensors, testing and analysis systems, particle measurement technology, mounting technology, etc.

All components and systems can be tailor-made to the needs of our customers.

HYDAC PSA-H70 – Particle Sampling Adapter for 700 bar Hydrogen Fuel Stations

By using the PSA-H70, the technical cleanliness of hydrogen can be analysed at the point of refueling.

The PSA-H70 is connected to the hydrogen fuel station. To ensure there are no leaks, a test pressure of approx. 800 bar is applied. Then the vehicle can be fueled.

In the process of refueling, the filter membrane of the PSA-H70 absorbs the impurities contained in the hydrogen. Once the refueling process is complete, the PSA-H70 is uncoupled, and the membrane filter is removed and analysed in the laboratory. After replacing the filter unit, the PSA-H70 is ready for use again.

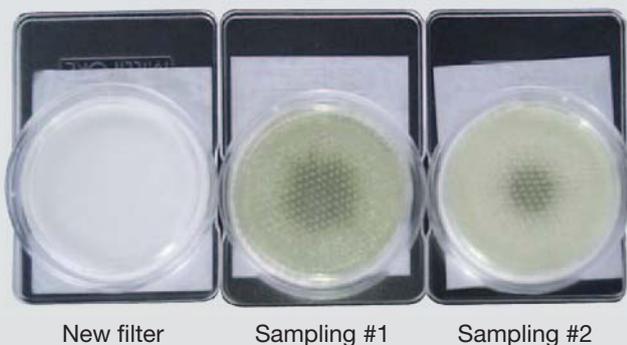
HYDAC PSA-H70



Advantages at a Glance

- ✓ World's first solution to verify the technical cleanliness at 700 bar hydrogen fuel stations (suitable for 350 bar systems by changing the fuel nozzle)
- ✓ Easy and fast on-site-sampling
- ✓ Immediate visualisation of the fuel station's quality
- ✓ Quantative and qualitative detection of particles during the refueling process (up to 875 bar)
- ✓ Hydrogen-compatible PTFE filter
- ✓ The check valve prevents backflow of the hydrogen-air mixture into the filling station
- ✓ The vent function enables components containing oxygen to be removed quickly from the refueling system
- ✓ Conforms to ASTM D7650
- ✓ Sampling for subsequent particle analysis according to ASTM D7651
- ✓ Sampling, analysis, cleaning and rebuilding service by HYDAC FluidCareCenter (stationary and mobile)

Analysis of the Sampling



Examples of Contamination



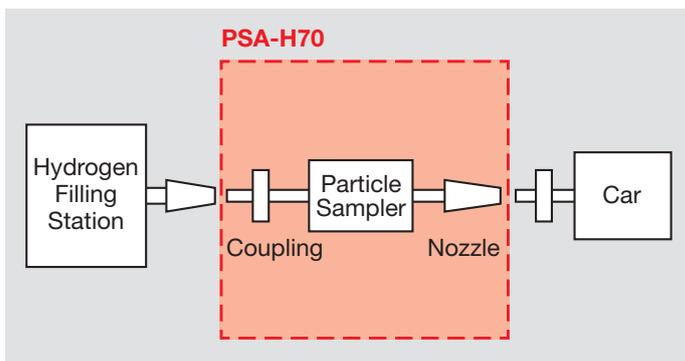
Largest reflective particle:
115 x 60 µm

Largest non-reflecting particle:
249 x 101 µm

Largest fiber:
1059 µm

Technical Specifications

Nominal size:	DN04
Nominal pressure P:	PN800
Flow rate Q:	60 g/s
Temperature:	medium: -40 °C to +80 °C ambient: -20 °C to +50 °C
Filter material:	PTFE
Filtration rating:	0.2 µm; 5 µm
Support grid:	150 µm
Weight:	approx. 16 kg



Step 1: Sampling and Analysis

Regardless of the compressor concept, high particulate contaminations were detected at all sampled hydrogen fuel stations.

HYDAC GF1 with HYDAC Chemicron® – The Filtration Technology for H₂ Applications up to 1,000 bar

The GF1 ensures the technical cleanliness of hydrogen for hydrogen fuel stations up to 1,000 bar. The combination of a filter housing specially developed for this application and unique filter element technology provides the greatest process stability with the best possible permeate quality. The filter element can be changed in just a few minutes during maintenance, without removing the filter from the gas line.

The design of the GF1 offers the maximum filtration area in the most compact dimensions and is therefore ideal for use on hydrogen fuel stations. The extremely robust stainless steel filter elements are noted for their outstanding differential pressure stability and resistance to pressure surges.

The Chemicron® metal fibre fleece developed by HYDAC delivers defined filtration rates and maximum filter integrity. The combination of different filter layers prevents perforation of the filter material during the fueling process. No resins at all are used in the construction of the filter element, hence electrostatic charging is avoided and operation with aggressive media subject to extreme temperature fluctuations is possible.

Advantages at a Glance

- ✓ TÜV verified
- ✓ Superior permeate quality according to robust stainless steel filter element technology
- ✓ Reliable filter design and high precise separation rate down to 0.1 µm
- ✓ Excellent differential pressure stability of up to 200 bar
- ✓ No electrostatic charging
- ✓ No resins used
- ✓ Easy maintenance – without pipe dismantling – clean side protection
- ✓ High chemical, mechanical and temperature resistance
- ✓ Long service life – maximum filtration area in compact design

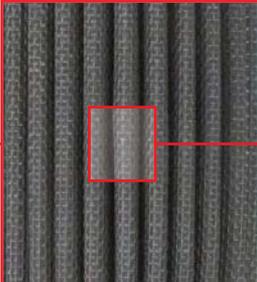
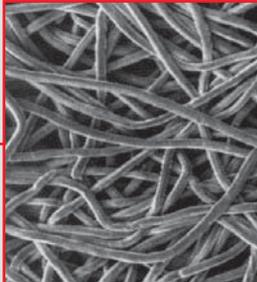
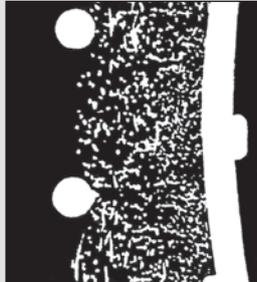


Technical Specifications*

Temperature:	-40 °C to +85 °C
Nominal pressure P:	1,000 bar
Flow rate Q:	60 g/s; 150 g/s
Filter material:	Stainless steel metal fibre fleece
Filtration rating:	0.1 µm; 10 µm
Connections:	AUTOCLAV 3/8; 9/16

* other specifications on request

HYDAC Chemicron®

<p>Stainless steel filter element</p>  <p>→ no electrostatic charging</p>	<p>Specific pleated filter design</p>  <p>→ best dirt-holding capacity due to maximum filtration area</p>	<p>Sintered metal fiber fleece</p>  <p>→ no fiber migration possible</p>	<p>Graduated filter structure</p>  <p>→ maximum filter porosity hence, lowest pressure loss</p>
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Step 2: Superior Filtration Technology

Combination of application optimized filter housing design and unique filter element technology



Your Professional Partner for Hydrogen Applications and Emission-free Mobility.

Founded in 1963, today the company has more than 7,000 employees worldwide. With over 45 overseas subsidiaries and more than 500 sales and service partner, HYDAC ist your reliable partner.

The product range contains components, sub-systems and complete systems for hydraulics, lubrication, oil cleanliness and process engineering.

HYDAC products are to be found in almost all sectors of industry.

The wide product range reaches from mechanical engineering, process technology, the mobile sector, energy technology, to applications in the offshore sector, aviation automotive/ automotive supplier and environmental technology.

Worldwide Specifications and Approvals

All HYDAC divisions are focused on world market requirements. The requirements of the market and their rapid achievement are the basis of our business activities and influence the action of each individual member of staff.

A product and result-orientated company structure, with its divisions and a high degree of delegation of responsibility, produces the very best organizational and technical qualifications in our staff.

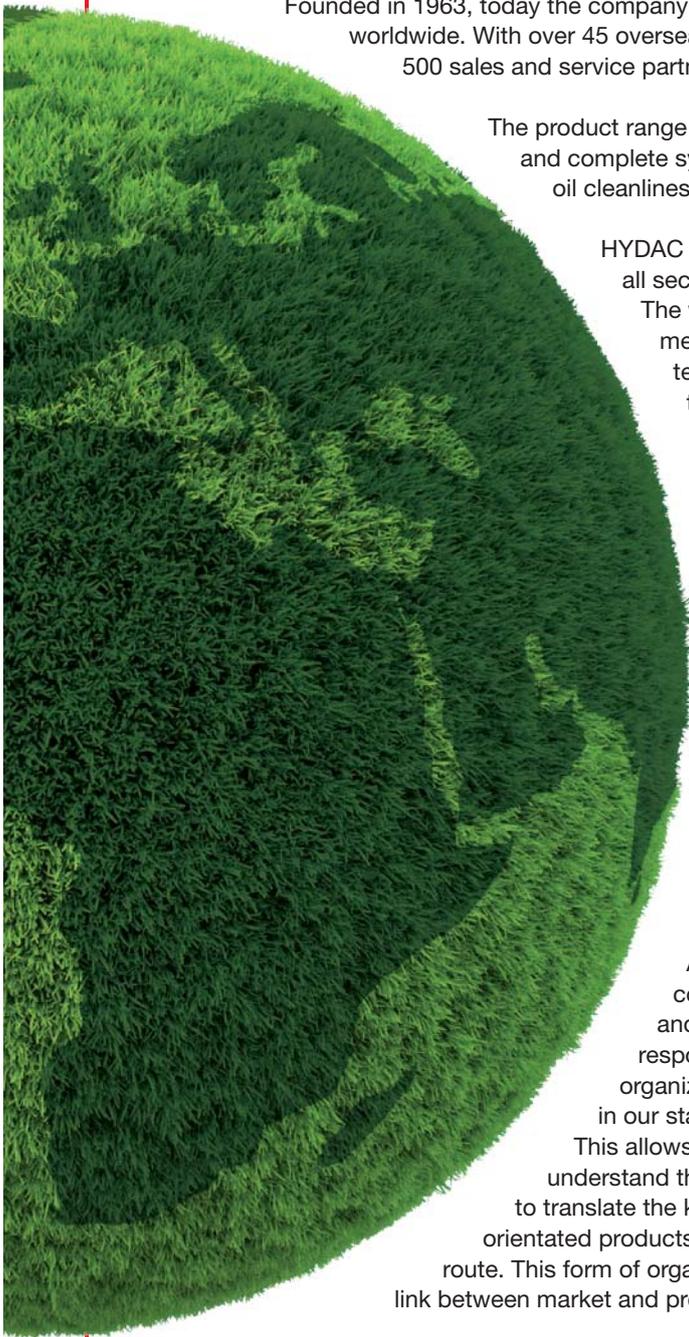
This allows them to fully recognize and understand the market requirements and to translate the knowledge gained into market-orientated products by the most direct and effective route. This form of organization guarantees the fastest link between market and product.

The HYDAC FluidCareCenter

You can count on top quality and innovation.

In the HYDAC FluidCareCenter, in collaboration with our customers, we develop innovative projects in a wide range of industries.

A skilled development team, using state-of-the-art computer-aided analysis, measuring and testing equipment and test rigs, ensures rapid implementation of the project.



Accumulator Technology 30.000



Filter Technology 70.000



Process Technology 77.000



Filter Systems 79.000



Compact Hydraulics 53.000



Accessories 61.000



Electronics 180.000



Cooling Systems 5.700



HYDAC FluidCareCenter Sulzbach/Saar, Germany



HYDAC Headquarters Germany



HYDAC USA



HYDAC China



HYDAC Great Britain



HYDAC Korea



HYDAC Japan



HYDAC Sweden



HYDAC Denmark

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