

## Filter solutions for hydrogen drives.

To support the use of hydrogen as a climate friendly energy carrier, Hengst has developed a modular system of various filtration solutions for transportation, stationary and maritime applications. It consists of ion exchangers cathode air filters and anode management and water separation for

fuel cells. As well as disk separators and active crankcase ventilation for hydrogen combustion engines, which ensure the service life, efficiency, performance and safety of the drive even under harsh operating conditions.



Blue-netic

### Cathode air filter

- Harmful gases in the intake air can damage the fuel cell and cause performance degradation
- Effective protection by cathode air filtration is essential
- Flexible design, to cover a wide fuel cell power range from 100 to 500 kW



Blue-netic  
AIR INTAKE SYSTEM

### Cathode air intake system

- Fuel cell gas filter provides effective protection of the catalyst and membrane
- Matched filter stages ensure highest dust hold capacity
- Modular filtration and air treatment stages provide easy adaptability



Blue-ion

### Ion exchanger

- Filter cartridge can be replaced without special tools
- Clean filter replacement and no leakage of coolant
- Easy to customize due to the modular design for different capacities (400meq, 800meq, 1500meq)
- Minimum differential pressure thanks to optimally matched resin filling



### Anode management & water separation

- Prevents water accumulation, flooding and blockage in the fuel filter stack
- Highly integrated system
- Combines the function of droplet water separation, gas purge and water drainage with an innovative valve configuration



Blue-tron

### Active crankcase ventilation

- Active ventilation system effectively counteracts the risk of ignition by minimizing the hydrogen concentration in the crankcase
- Integrated electronics system controls the speed of the brushless motor

## The wide world of filtration.

As a family operated company with 3,500 employees at 23 locations, Hengst Filtration is known worldwide for its innovative filtration and fluid management solutions.

Our products are used in millions of applications around the world to make something cleaner. But we can do even better. We think filtration – in everything we do. We deliver leading edge filtration systems for the fields of plant and machine engineering, industrial filtration, hydraulics, life science and health care.

Our custom-tailored solutions are used in medical cleanrooms, air conditioning systems, cleaning machines, industrial systems, electric tools and robots.

We are also an OEM supplier for the international automotive and motor industry and a development partner for sustainable drivetrain and mobility concepts. **For the fuel cells and hydrogen engines, we offer high-performance filter solutions for economical use.**



## Making our planet a purer place.

Mobility, Health, Economy, Environmental Protection & Sustainability: Our daily work focuses on the major issues of our time. With the goal of making the planet a cleaner place. This enables worldwide forward-looking technologies in all industries.

### Do you have any other questions?

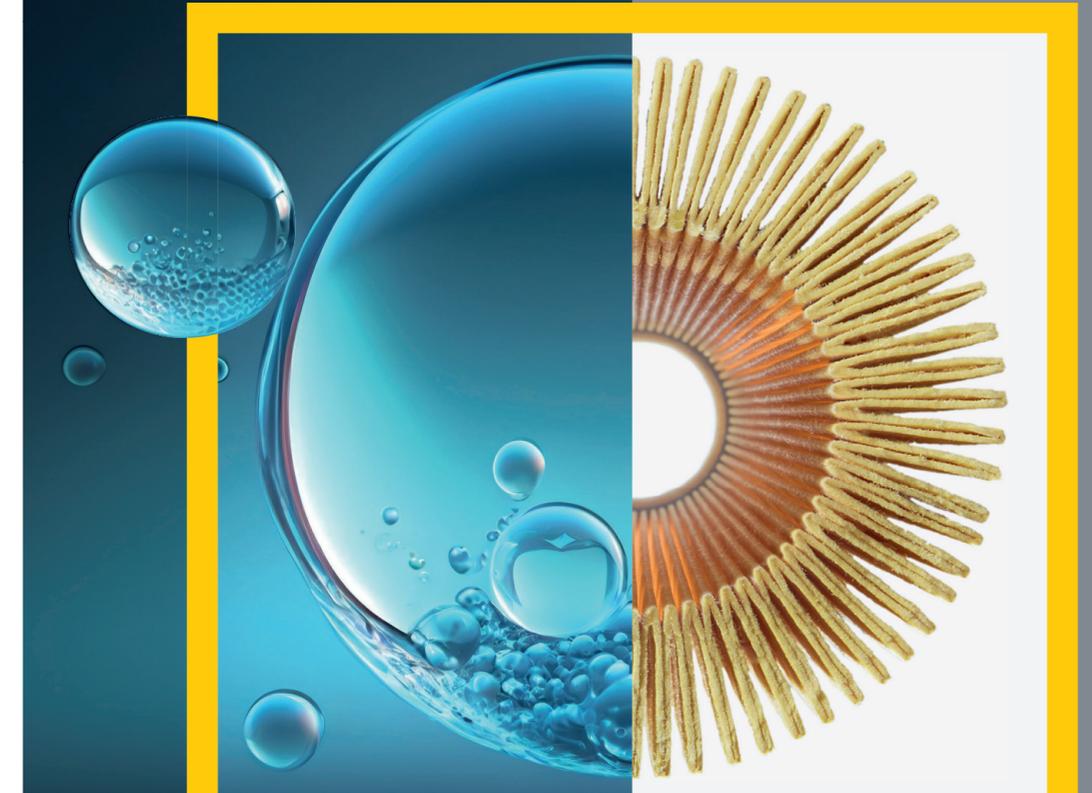
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**Hengst**  
FILTRATION



## Filtration for a hydrogen future.

**High-performance filter systems for the economical use of fuel cells and hydrogen combustion engines.**

purifying our planet

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**Hengst**  
FILTRATION

## Solutions for hydrogen combustion engines.



Blue.tron

Hengst developed **active ventilation** as part of an overall filter concept for hydrogen engines that also features an **electrically driven Blue.tron disk separator**. The latter reliably separates the finest of oil particles from the blowby flow. The cleaned liquid is conducted back to the oil circuit while the gas flows into the intake system via a **pressure regulating valve**.

The requirements for filter systems in hydrogen engines are comparable to those for conventional gasoline or diesel engines. Increased water ingress into the engine oil and the easy flammability of hydrogen present additional challenges. Blowby gases that enter the crankcase via the cylinders form an explosive mixture at concentrations above 3.5% by volume, which can easily ignite on contact with the hot engine components.

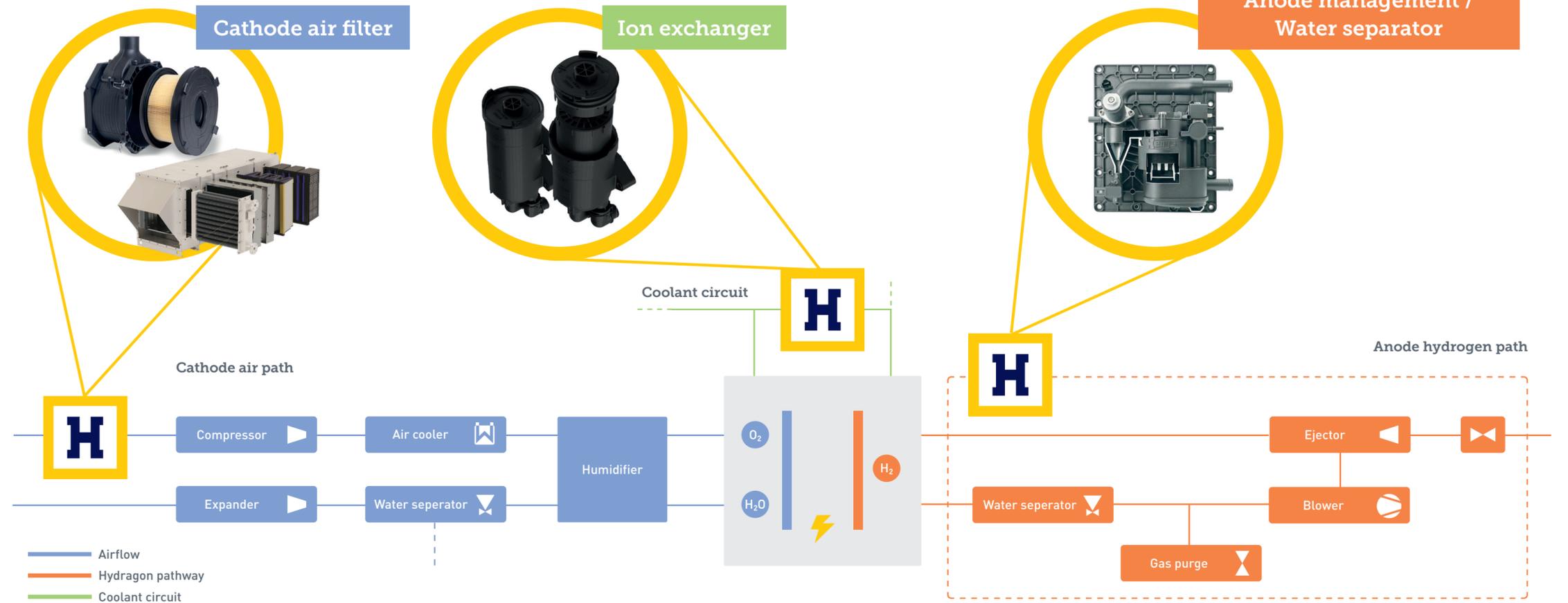
The innovative active ventilation system effectively counteracts the risk of ignition by minimizing the hydrogen concentration in the crankcase. It consists of specially developed air valves that conduct cleaned, dry fresh air directly into the crankcase. The valves are located in the engine and switch between air extraction upstream of the turbocharger at part load and downstream of the turbocharger at full load, thus maintaining a pressure drop to the crankcase at all times.

An integrated electronics system controls the speed of the brushless motor for the disk separator. Depending on the combustion engine's speed and load, this system maintains an optimum separation rate for engine oil in the blowby flow.

## Solutions for the fuel cell.

Developed as standard or customized modules, Hengst fuel cell solutions provide a valuable contribution towards CO<sub>2</sub> neutral mobility. They are used at three places in the system: in the **ion exchanger** for the

cooling circuit, **cathode air filter** in the air supply and **anode management / water separation** in the hydrogen supply.



The **cathode air filter** prevents damage to the fuel cell catalyst and membrane by separating harmful gases effectively. The range of applications extend from small fuel cells and mobile systems in the on- and off-highway segment to large-scale systems for stationary power generation and for maritime applications.

The **Blue.iox ion exchanger** ensures safe and efficient operation by minimizing the electrical conductivity of the coolant for the fuel cell. It can be integrated in the main flow or in parallel connection with components of the coolant and available in capacities up to 1500meq and various designs.

Using an innovative valve technology, the novel **separator module for anode gas recirculation** combines the function of water-droplet separation, gas purge and water drainage.

