

HYDAC INTERNATIONAL

**Automatic
Back-Flushing Filter
AutoFilt® RF9.**



AutoFilt® RF9 – Clearing the Way.

The Challenge:

In response to the Tier III standard which will come into effect in 2016, the International Maritime Organization (IMO) is placing tighter limits on the greenhouse gases, such as nitrogen oxide and sulphur oxide, produced by shipping. Marine engine builders are banking on common rail systems to reduce fuel consumption and exhaust gases, resulting in new requirements for efficient fluid management in marine engines.

HYDAC's solution:

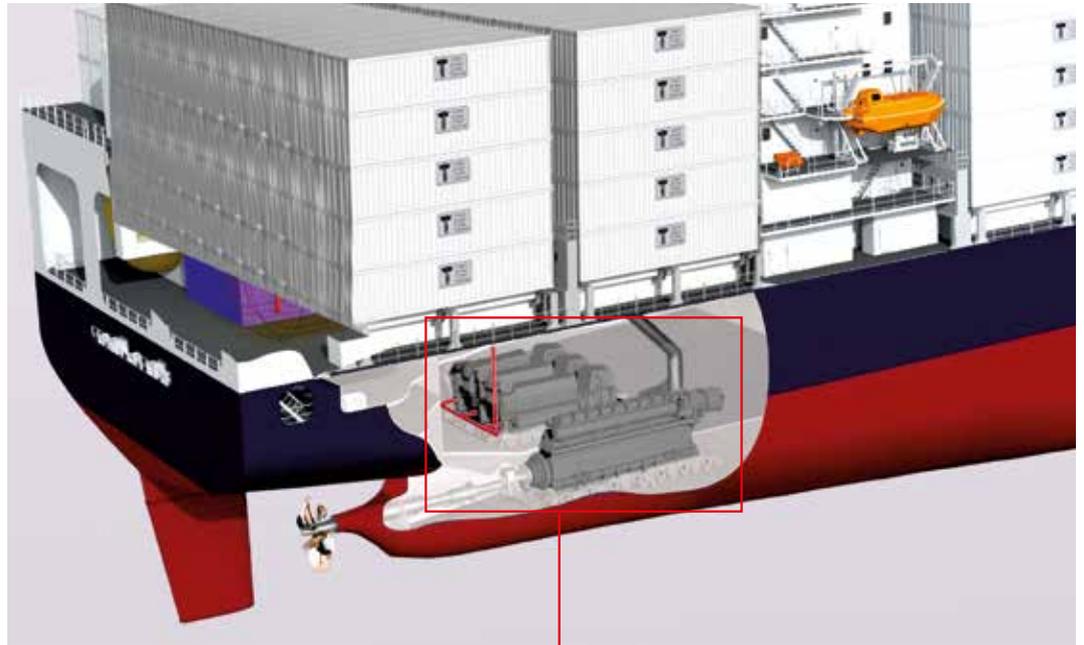
To meet the resulting demand for cleanliness in marine fuels and lubricants, HYDAC presents the new AutoFilt® RF9.

This filter is a product of HYDAC's expertise and strong innovative drive. In combining the two disciplines, namely robust filtration and tried-and-tested piston accumulators, a new, cutting-edge filter technology has emerged. What sets the AutoFilt® RF9 apart is its patented hydropneumatic back-flushing technology, and secure media separation.

The specially developed filter elements with filtration ratings from 1 µm (absolute) offer low flow resistance and high contamination retention capacities. They also clean without leaving any residue.

You can benefit from robust filter technology with consistently high cleanliness classes – for diesel fuels, too, up to ISO 11/8/7 – and highly efficient back-flushing, all in one system.

Efficient fluid management for marine engines.



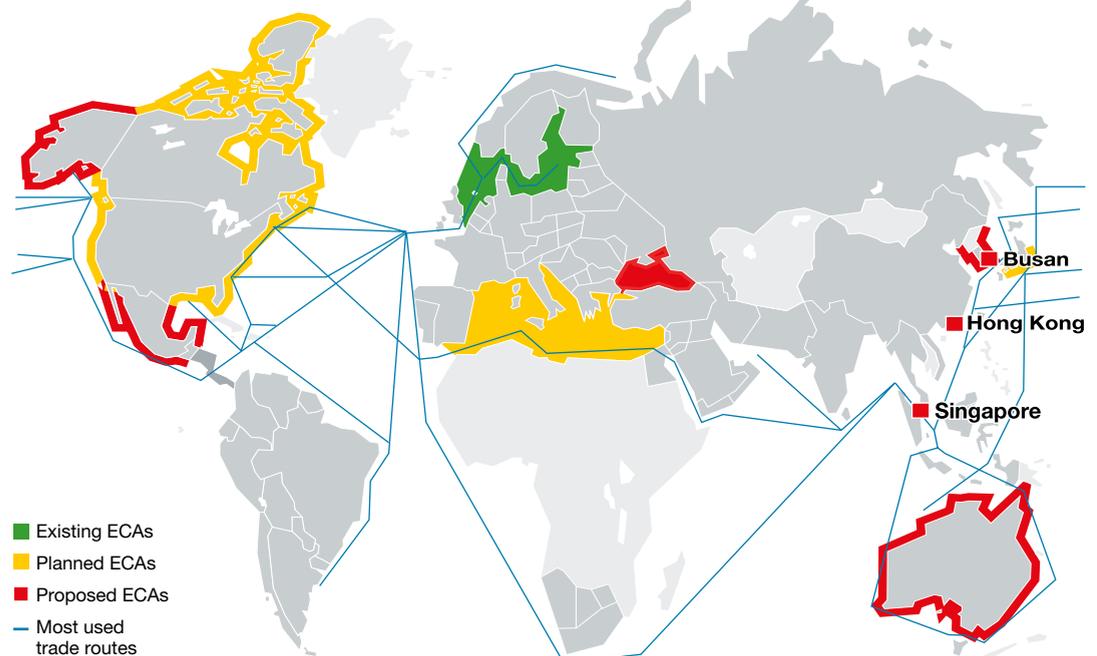
Clean fuel, clean combustion, clean air.

- Heavy Fuel Oil
- Diesel
- Marine Diesel Oil / Marine Gas Oil
- Biodiesel oil
- Lubricating oil

AutoFilt® RF9.

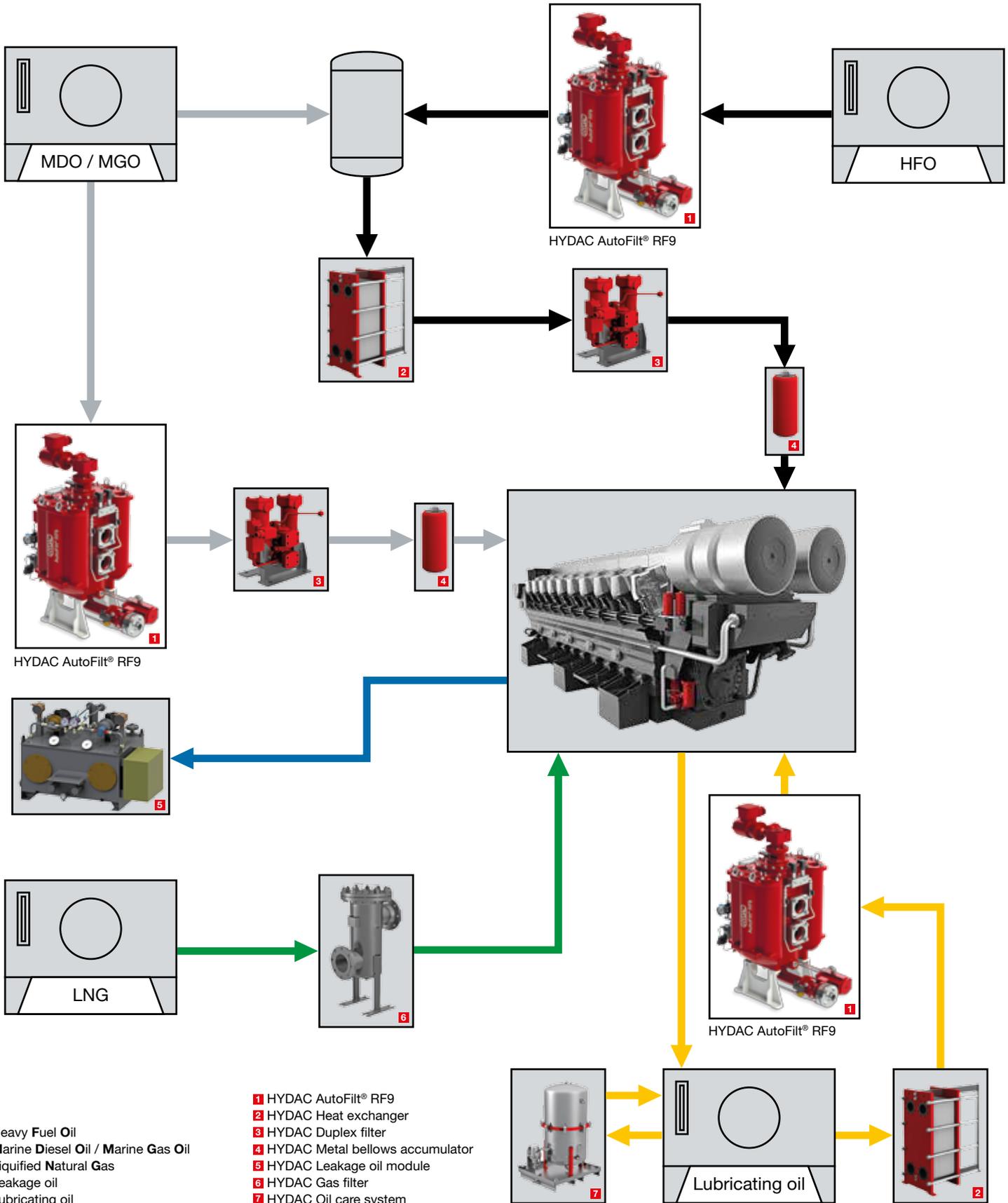


ECA (Emission Control Area) guidelines.



On every sea. In every port.

At the heart of filtration – the AutoFilt® RF9 – covering all aspects of the marine engine.



Robust filter technology on the outside.

Qualities of the AutoFilt® RF9 back-flushing filter.

- Back-flushing driven by external medium
- No mixing with the compressed air
- Adjustable back-flushing intensity
- Efficient hydraulic cleaning
- High cleaning efficiency
- No reduction in pressure during back-flushing
- Low compressed air consumption
- Low pressure drops
- Large filter surface for its compact size
- Low-maintenance, service-friendly design
- External heater possible
- Intelligent control system

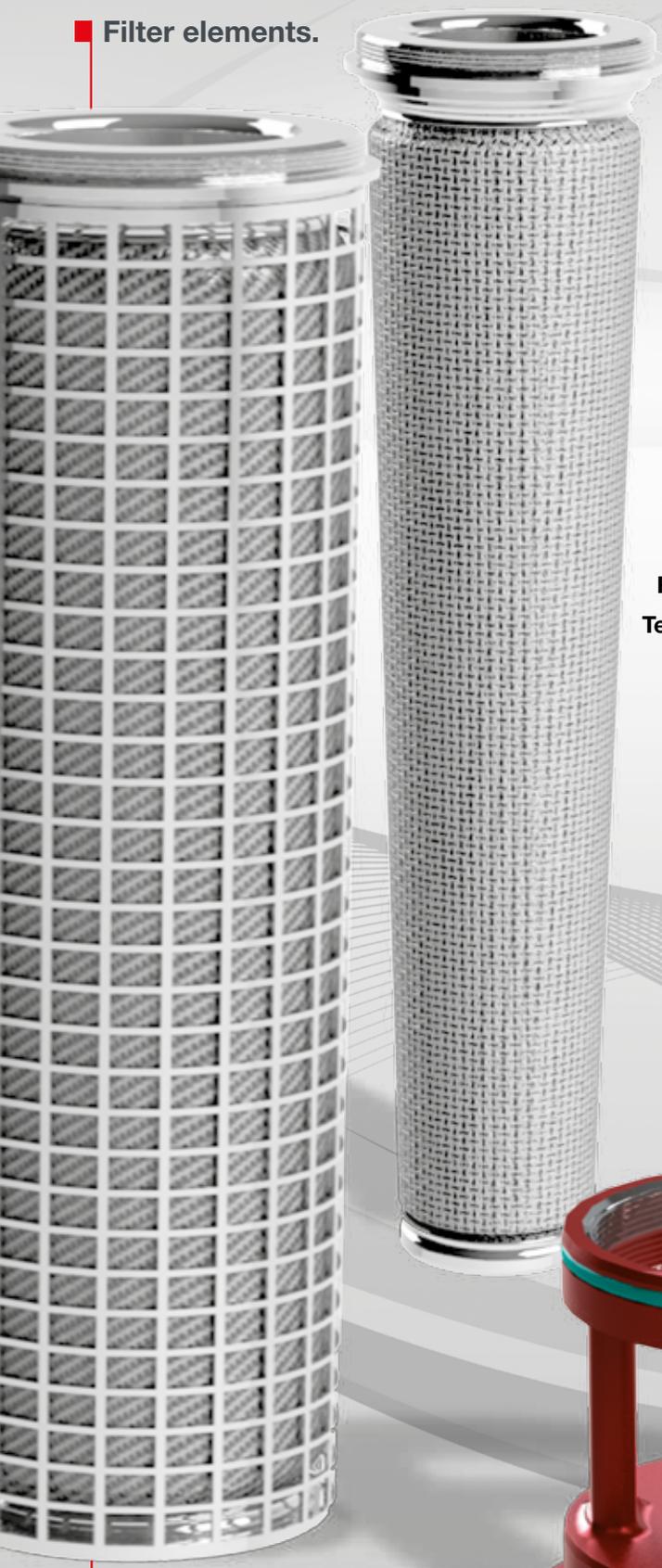
Terminal box

Compressed air tank

Pneumatic control unit



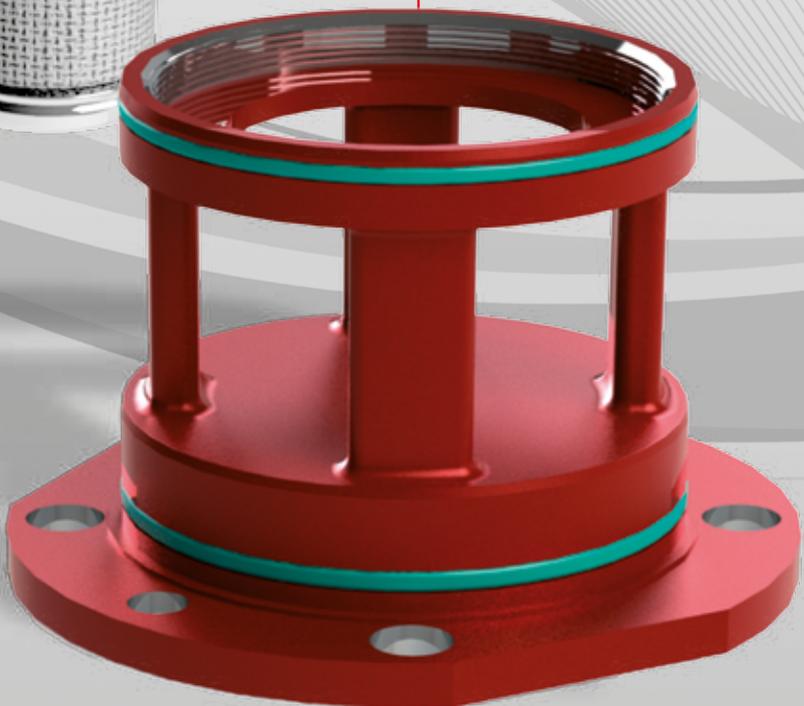
Filter elements.



Selection of filter materials.*

Filter material			
Description	Chemicon® metal fibre	Dutch weave	Square mesh
Filtration	Depth filtration	Surface filtration	Surface filtration
Material	Stainless steel	Stainless steel	Stainless steel
Filtration rating µm	1 to 100	25 to 60	100 to 500
Retention rate	Absolute	Nominal	Nominal
Temperature °C	400	400	400

*Other materials and filtration ratings on request and dependent on the particular operating conditions.



Back-flushing that makes the difference.

Filtration

Consistent filtration performance.

The medium enters the filter housing via the inlet and is distributed evenly to the different filter chambers. One cleaned filter chamber is always on stand-by.

The flow direction through the filter elements (A) in the chambers is from the outside to the inside. The contamination is separated from the fluid on the outer surface of the filter element and is retained there.

The cleaned medium leaves the various filter chambers, collects in the upper part of the filter housing and exits the filter through the outlet.

As the level of contamination in the filter elements increases, the differential pressure in the filter increases.

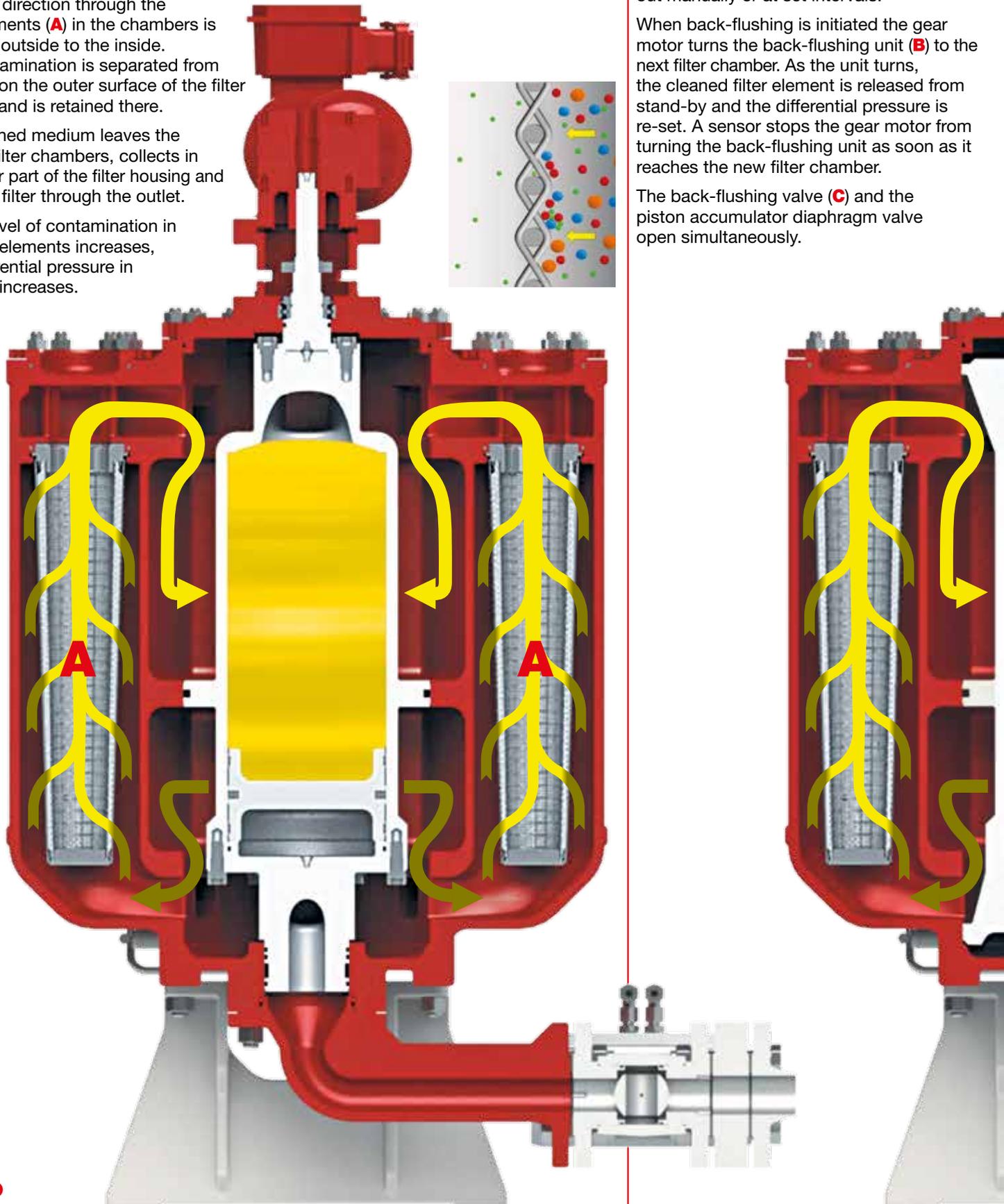
Preparing to flush

Without interrupting the filtration.

When the differential pressure in the filter reaches the pre-set value, back-flushing is initiated. Back-flushing can also be carried out manually or at set intervals.

When back-flushing is initiated the gear motor turns the back-flushing unit (B) to the next filter chamber. As the unit turns, the cleaned filter element is released from stand-by and the differential pressure is re-set. A sensor stops the gear motor from turning the back-flushing unit as soon as it reaches the new filter chamber.

The back-flushing valve (C) and the piston accumulator diaphragm valve open simultaneously.



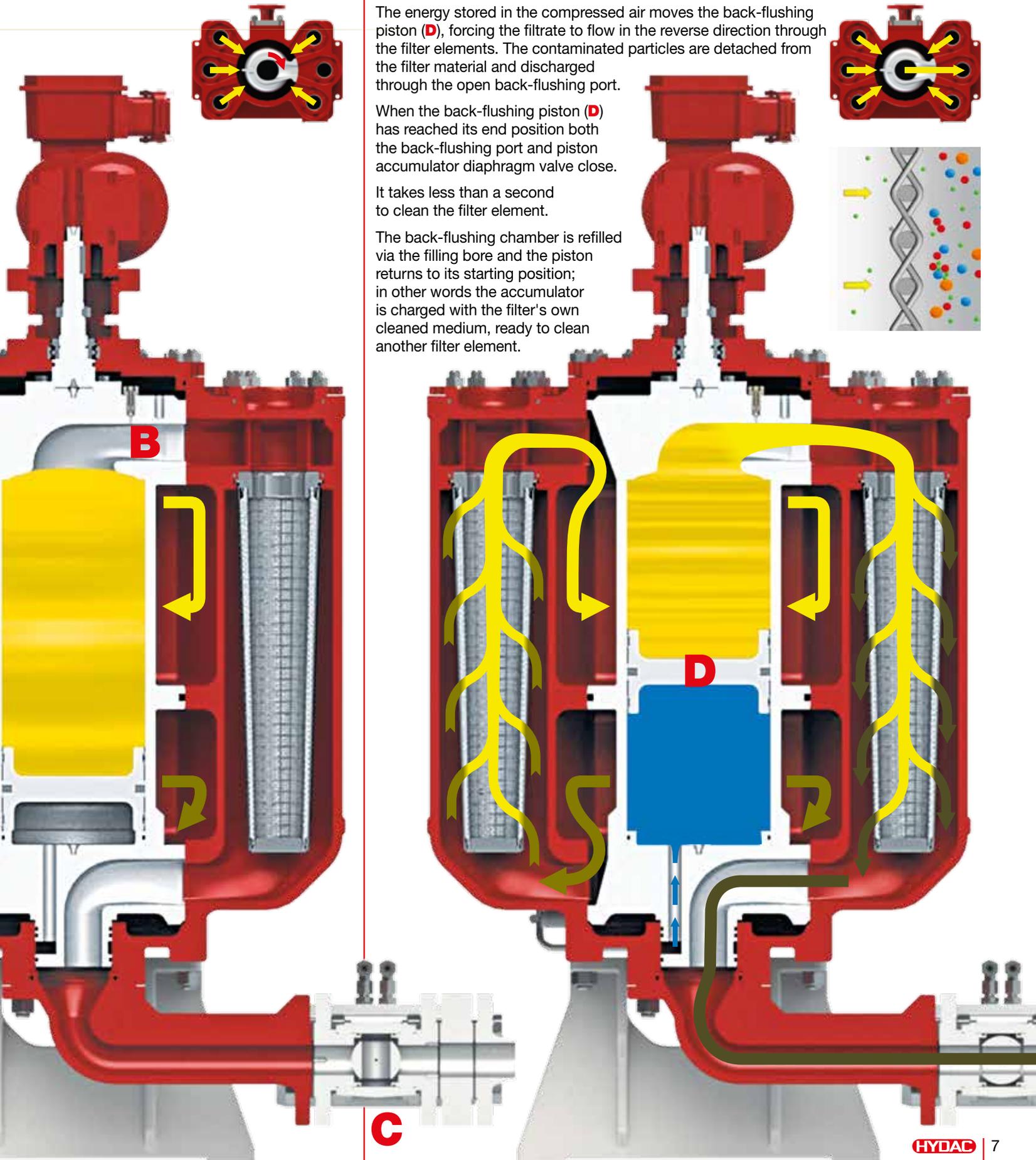
Back-flushing With excellent efficiency.

The energy stored in the compressed air moves the back-flushing piston (D), forcing the filtrate to flow in the reverse direction through the filter elements. The contaminated particles are detached from the filter material and discharged through the open back-flushing port.

When the back-flushing piston (D) has reached its end position both the back-flushing port and piston accumulator diaphragm valve close.

It takes less than a second to clean the filter element.

The back-flushing chamber is refilled via the filling bore and the piston returns to its starting position; in other words the accumulator is charged with the filter's own cleaned medium, ready to clean another filter element.



Best Performance!

The merits of the AutoFilt® RF9 are what make the difference to performance, quality and service life.

Filter elements held securely:



Special design to hold filter elements securely

A lug in the filter chamber prevents the filter element from working loose or falling out

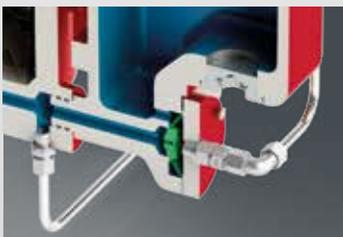
Easy to handle

- No tools or specific torque required
- Filter elements can easily be screwed in by hand by the user

Changing the filter element

Changing the element is quick and easy - simply remove the filter cover plate

Piston accumulator diaphragm valve:



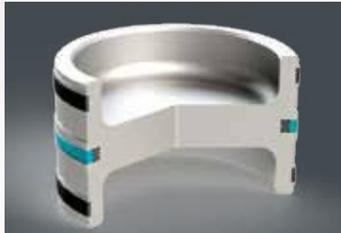
Powerful cleaning

- The piston accumulator diaphragm valve is equipped with a special high temperature diaphragm
- This diaphragm ensures that a large fluid mass is used and moves the piston at a constant discharge speed

Cleaning without any residue

- The filtrate is pushed with high kinetic energy through the filter material in the opposite direction to the filtration
- Deposits and contaminants are very effectively detached from the filter material and discharged via the back-flushing line

Back-flushing piston:



Guaranteed separation of filtrate and compressed air

- Cleaning is carried out using its own cleaned medium (filtrate)
- The external energy required for cleaning the filter elements is provided by compressed air

Special H design

Permits installation in any position

Flushing device:



Optimized flow dynamics

- Maximum flow cross-section of inlet and outlet on back-flushing unit is guaranteed to allow for tolerances
- Special design to compensate for casting tolerances and prevent the flow losses that arise when openings are identical in size

Flexible design

Reliable filter operation is guaranteed by the fact that the gear motor does not need to be set to a specific direction of rotation

Optimum adaptability for every application

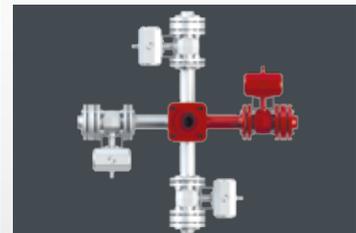
The filling bore is specially designed to take different sized orifices for optimal charging of the accumulator

Pneumatic control unit:



Variable adjustment of the back-flushing pressure optimizes the back-flushing process

Back-flushing port:



Can be configured to suit installation situation

- The back-flushing port can be rotated through 360° in 90° steps
- Space-saving positioning

Trace heating (optional):



Start not dependent on temperature

Highly viscous media such as heavy diesel oils can be pre-heated for a cold start. Potential heat losses are offset.

Choice of heating media

Various heating media can be used:

- Hot water (Tmax 200 °C / Pmax 16 bar)
- Steam (Tmax 200 °C / Pmax 16 bar)
- Thermal oil (Tmax 200 °C / Pmax 16 bar)

Innovative filter technology on the inside.

Gear motor with position monitoring

Differential pressure monitoring

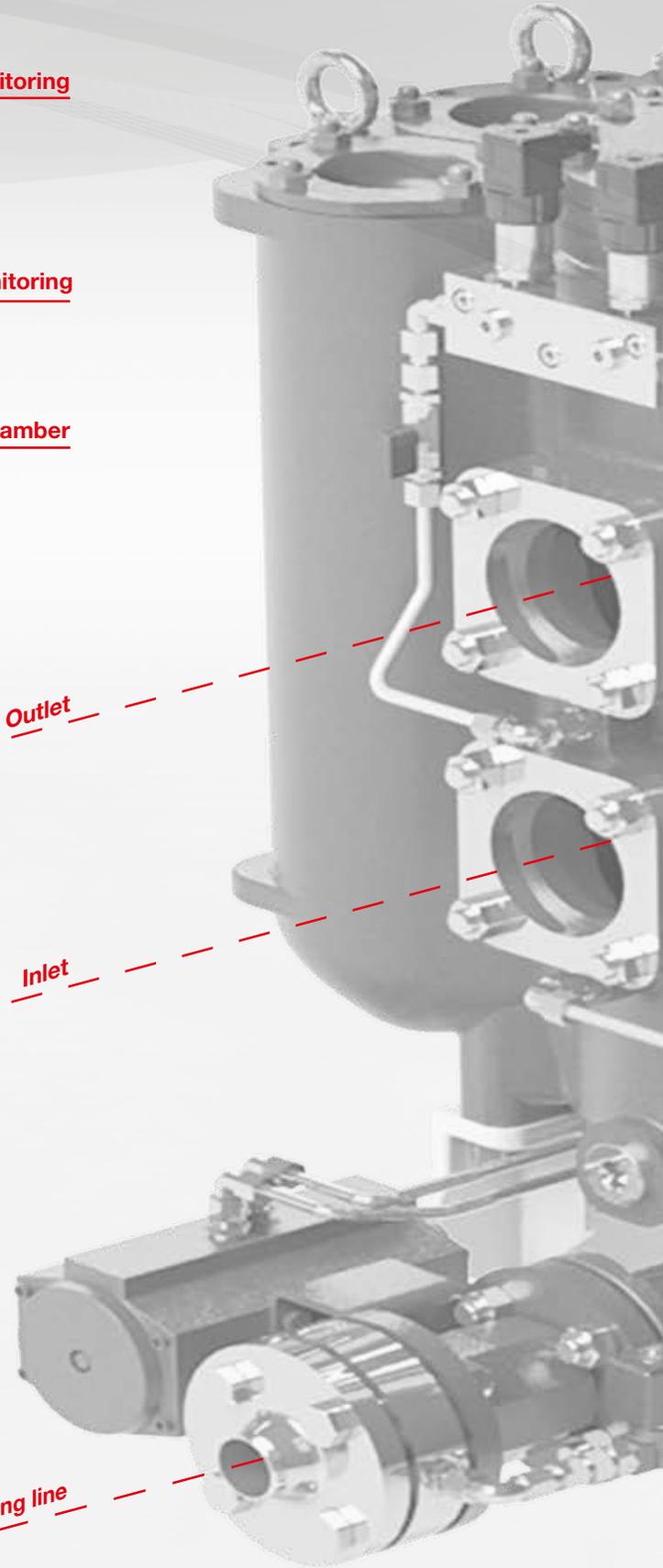
Filter chamber

Outlet

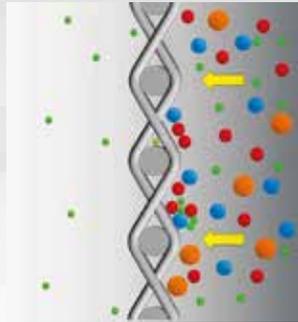
Inlet

Back-flushing line

Pressure release valve



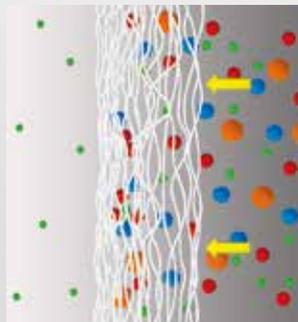
Surface filtration.



Essentially, the particles are separated at the surface of the filter material. Once a pre-set pressure drop is achieved or according to fixed intervals, the filter materials are cleaned and the filtration process can continue continuously or intermittently.

Retention rate - nominal:
The test filter must retain 90 - 95 % of all particles larger than the given filtration rating.

Depth filtration.



The fluid being cleaned penetrates the filter structure. The contaminating particles become trapped in the deeper layers of the filter. The flow resistance increases as the media becomes more and more clogged, with the result that the filter element must be back-flushed.

Retention rate - absolute:
The test filter must retain at least 99.5 % of all particles larger than the given filtration rating.

Expertise when it comes to filtration.

Know-how produces efficient solutions:
The FluidCareCenter at HYDAC.



To provide the right environment to develop, revise and optimize filtration solutions tailored to specific applications, HYDAC has established its own research and development centre, the only one of its kind in the world.

At the HYDAC FluidCareCenter we have built up a wealth of knowledge of media and their properties, we put new developments to the test and our visions become new products.



All the knowledge held collectively in the HYDAC FluidCareCenter reaches far beyond the visible technology. In addition to the systematic analysis of fluids, we are commissioned to run tests based on good science and issue corresponding reports. Our objective is to develop machines and systems which are optimized for lubrication applications. This know-how, together with the product range across the whole HYDAC group, creates synergies which are reflected in the AutoFilt® RF9. The RF9 combines state-of-the-art filtration with proven piston accumulators to produce a high-end solution.

Bubble point test rig:



Quality testing for filter elements to ISO 2942.

High flow test rig:



Flow rate test rig to determine a filter's flow capacity.

Hydromechanical test facility / Universal test rig:



Measurement of:

- Collapse burst pressure to ISO 2941
- Flow fatigue resistance to ISO 3724
- Flow characteristics to ISO 3968

Cold start test rig:



Simulation of cold start conditions on filters.

Multi-pass test rig:



Filtration efficiency and contamination retention capacity determined by multi-pass test to ISO 16889.

The filter which grows with the task.

The AutoFilt® RF9 is highly versatile.

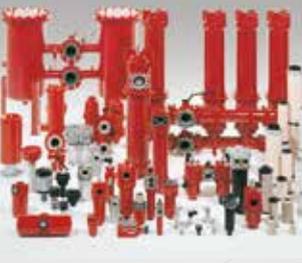


HYDAC's AutoFilt® RF9 was designed for use on ships and complies with the design specifications of all international classification organizations.

AutoFilt® RF9	RF9-0	RF9-1	RF9-2	RF9-3	RF9-4	RF9-5	RF9-6	RF9-7	RF9-8	RF9-9
Connection (DN)	25 / 32 / 40 / 50	32 / 40 / 50 / 65	40 / 50 / 65	50 / 65 / 80	65 / 80 / 100	100 / 125	125 / 150	150 / 200	200 / 250	250 / 350
Design	PED 97/23 EC AD 2000									
Material	EN-GJS-400-15 / DIN EN 1563 / AD 2000 W3/2									
Permitted operating pressure	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	10 bar 145 psi	10 bar 145 psi
Permitted test pressure	25 bar 363 psi	25 bar 363 psi	25 bar 363 psi	25 bar 363 psi	25 bar 363 psi	25 bar 363 psi	25 bar 363 psi	25 bar 363 psi	16 bar 232 psi	16 bar 232 psi
Permitted operating temperature	180 °C 356 °F	180 °C 356 °F	180 °C 356 °F	180 °C 356 °F	180 °C 356 °F	180 °C 356 °F	180 °C 356 °F	180 °C 356 °F	180 °C 356 °F	180 °C 356 °F
Weight	120 kg	270 kg	295 kg	320 kg	370 kg	480 kg	540 kg	630 kg	1050 kg	1200 kg
Volume	20 l	40 l	45 l	50 l	60 l	110 l	130 l	150 l	320 l	360 l
No. of filter chambers	2	2	3	4	6	4	6	8	6	8
Pilot air supply	4-10 bar / 58-145 psi									
Back-flushing process	Hydropneumatic back-flushing with secure media separation									
Back-flushing medium	Filtrate									
Volume per flushing	1.1 l	5.0 l	5.0 l	5.0 l	5.0 l	9.0 l	9.0 l	9.0 l	17.7 l	17.7 l
Air consumption per flushing	0.01 m ³ atm.	0.01 m ³ atm.	0.01 m ³ atm.	0.01 m ³ atm.	0.01 m ³ atm.	0.01 m ³ atm.	0.01 m ³ atm.	0.01 m ³ atm.	0.03 m ³ atm.	0.03 m ³ atm.
Flushing duration	< 2 sec.	< 2 sec.	< 2 sec.	< 2 sec.	< 2 sec.	< 3 sec.	< 3 sec.	< 3 sec.		
Trace heating (optional)	2	2	2	2	4	2	4	4	n.a.	n.a.
Permitted operating pressure	10 bar 145 psi	10 bar 145 psi	10 bar 145 psi	10 bar 145 psi	10 bar 145 psi	10 bar 145 psi	10 bar 145 psi	10 bar 145 psi	n.a.	n.a.
Permitted test pressure	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	16 bar 232 psi	n.a.	n.a.
Permitted operating temperature	200 °C 392 °F	200 °C 392 °F	200 °C 392 °F	200 °C 392 °F	200 °C 392 °F	200 °C 392 °F	200 °C 392 °F	200 °C 392 °F	n.a.	n.a.
Heating medium	Hot water / steam / thermal oil	Hot water / steam / thermal oil	Hot water / steam / thermal oil	Hot water / steam / thermal oil	Hot water / steam / thermal oil	Hot water / steam / thermal oil	Hot water / steam / thermal oil	Hot water / steam / thermal oil	n.a.	n.a.



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

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