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АВТОМАТИЧЕСКИЕ ФИЛЬТРЫ С ОБРАТНОЙ ПРОМЫВКОЙ

Alfa Laval 290 Filter

Automatic oil filtration

Diesel engines are evolving in order to comply with stringent IMO emissions standards and to improve energy efficiency. As a result, modern engines require filtration adapted to new oil cleanliness standards, without impacting on pressure drop or space consumption. To lift this challenge, available filtering area needs to be increased in an optimized volume.

Compact and reliable, the Alfa Laval 290 filter is a self-cleaning disc-type automatic filter designed to protect sensitive engine parts. It provides full-flow filtration, particularly in lubricating oil and hydraulic control oil used for diesel engine installations onboard ships and in power plants.

Application

The Alfa Laval 290 filter is equipped with innovative Alfa Laval Atrium technology, which enables continuous automatic backflushing filters with virtually no pressure drop, even in the case of fine filtration. This innovative technology makes it possible to employ a large filtering area using less space than conventional automatic backflushing filters. It also improves backflushing efficiency due to enhanced distribution method that more effectively disperses the unfiltered oil to be cleaned.

Benefits

- *Maximum engine protection, minimal engine wear*
The Alfa Laval 290 filter provides fine filtration of particles in oil down to 6 micron in size – with virtually no pressure drop. Its small footprint and large filtration surface area ensure proper engine lubrication and minimal engine wear, thereby safeguarding engine operation.
- *Compact and versatile*
The Alfa Laval 290 filter offers up to 30% more filter surface area compared to conventional filters with the same footprint. Its footprint can be made even more compact when the filter is integrated directly into the engine.
- *Easy to install, operate and maintain*
No additional electrical power, air connection or dedicated tank is required. The Alfa Laval 290 filter is designed for start-and-forget operation. Large filtering area reduces stress on the filter mesh, thereby prolonging the intervals



Alfa Laval 290 filter: More compact footprint, yet higher capacity with up to 30% more filter area than traditional automatic filters.

between inspection. In addition, maintenance is quick and easy because there are few parts to disassemble.

- *Reduced total cost of ownership*
The Alfa Laval 290 filter is perfectly suited for improving total cost of ownership. Long-lasting wear parts reduce spares consumption and maintenance costs are reduced to minimum. In addition, lubrication oil lifespan can be increased by up to four times if installed with the optional Alfa Laval Eliminator configuration. Diversion-type filters also are an alternative to traditional cartridge-consuming backflush treatment devices.

Design

The Alfa Laval 290 filter is engineered for fine particle filtration of lubricating and hydraulic oil – with virtually no impact on pressure drop. It uses innovative Alfa Laval Atrium technology, which offers the best ratio between the filtering surface and the total footprint/volume of the filter available on the market.

The filters can be configured as a stand-alone filter, as an engine-mounted filter, or with by-pass valve and redundancy filter to meet virtually any filtration requirements. The Alfa Laval 290 filter can either be mounted to the engine or, when a more compact footprint is required, integrated into the engine. Standard, duplex and custom configurations are available.

Disc-shaped filter elements

The main components of the Alfa Laval 290 filter are patented disc-shaped Atrium filter elements (Figure 1) assembled into a disc stack. One filter element is comprised of two identical halves.

Ribbed aluminum filter frame

Each half includes a stack of filter media housed in an aluminum frame with ribbed sections (Figure 2). The filter media has three layers: two outer layers to provide support and fatigue resistance and a filter layer in the middle.

Wide openings for filter inlet and outlet

The Alfa Laval Atrium technology also features a special arrangement of the filter mesh for wider openings at the inlet and outlet than conventional filters. These enlarged openings smooth the passage of oil through the filter (Figure 3, cut A–A).

Operating principle

The Alfa Laval 290 filter can be used for fine filtration of lubricating oil for four-stroke engines and for hydraulic oil used for two-stroke engines.

For lubricating oil used for four-stroke engines

Unfiltered oil is transferred from the sump by means of a pump, through a heat exchanger, and on to the lubricating oil filter. Filtered oil then passes to the engine. Backflushed oil is re-circulated to the tank. For highly efficient sludge removal, an optional sludge removal centrifuge can be installed on the backflush line. Oil cleaned in the centrifuge is then transferred to oil tank (Figure 4).

For hydraulic control oil used for two-stroke engines

Unfiltered oil is transferred from the sump by means of a pump, through a heat exchanger and, on to the main filter. Most of the filtered oil is used as engine lubricating oil; the remainder is sent for fine filtration in the hydraulic control oil filter and then to engine. Outlet flow is cleaned down to 6µm to protect the hydraulic control oil system, sensitive to fine pollution and low pressure. The backflush flow is filtered in the diversion chamber and directly re-circulated to the oil tank (Figure 5).

Optimized flow distribution system

Each filter element features a highly optimized flow distribution system (Figure 6). Ribs in the aluminum filter frame separate each element into 16 sealed, self-contained sections. The filter elements are stacked to meet the capacity requirements of the application and compressed together between two frames and by several springs. This guarantees tight seals between elements. A star-shaped shaft divided in 16 different columns is fitted to the stack center. Each column faces an individual section of the filter element, thereby forming 16 independent filtering columns.

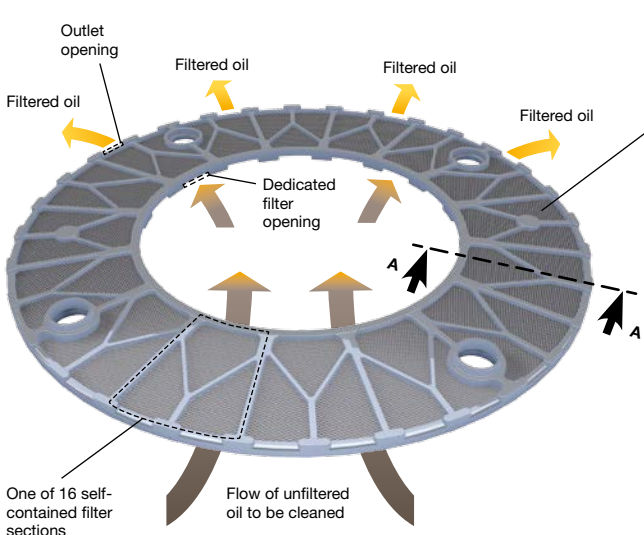


Figure 1. Patented Alfa Laval Atrium filter element.

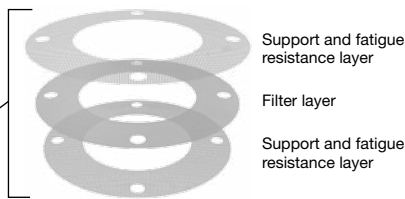


Figure 2. Alfa Laval Atrium technology is comprised of three layers housed in a filter frame.

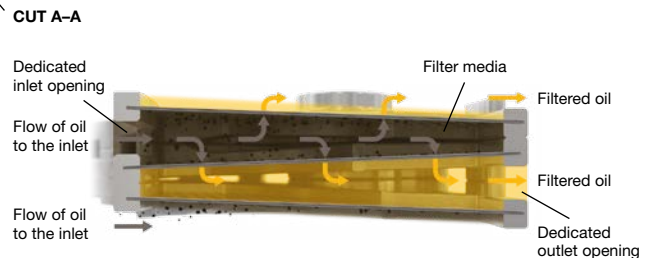
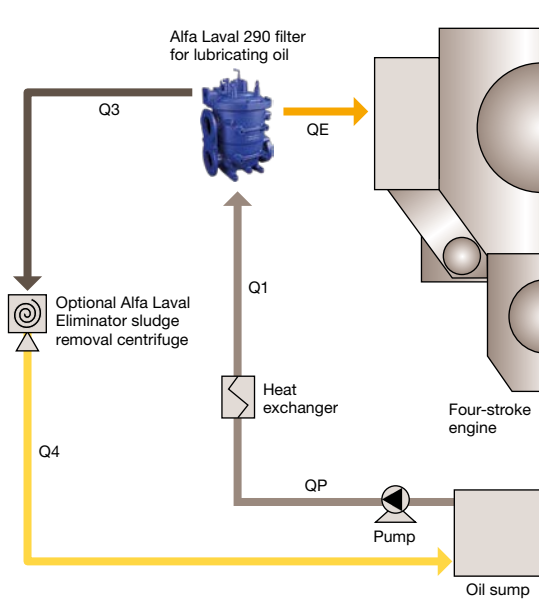


Figure 3. Cross-section of Alfa Laval Atrium filter element with a special arrangement of the filter mesh for wider openings at the inlet and outlet than conventional filters allows smooth the passage of oil through the filter.



QP = Lubricating oil pump capacity
 Q1 = Maximum capacity of the filter
 Q3 = Flow of backflushed oil
 Q4 = Flow of backflushed cleaned oil
 QE = Lubricating oil flow to the engine

Figure 4. Schematic diagram of a lubrication oil system for a four-stroke engine.

A hydraulic motor driven by system pressure on top of the filter housing actuates a distributor. The distributor in contact with the star-shaped shaft rotates continuously to feed oil for filtration into one of the 16 columns. An indicator shows the rotation of the hydraulic motor and can also be actuated manually in case of emergency.

Continuous backflushing

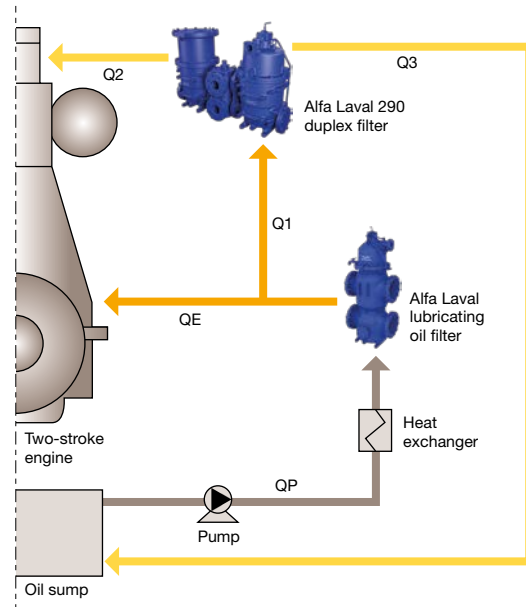
The unfiltered oil entering the filter passes through a strainer. The distributor uniformly disperses the unfiltered oil into 15 of the 16 full-flow filtering columns. Solids collect on the filter medium and the filtered oil flows to the engine. Most of the filtered oil exits the filter element at the outlet. However, a small amount of the filtered oil, typically about 3%, passes through the sixteenth column in order to remove previously collected solids by backflushing the filter elements.

This oil is taken through a passage in the distributor, which rotates at continuous intervals to feed oil for filtration in 15 columns and to backflush in the sixteenth. In this way, all the columns are backflushed once per full rotation of the distributor. Backflushed oil is then re-circulated back to the oil tank for cleaning.

Highly efficient sludge removal

For highly efficient removal of solids in the backflushed oil, two optional treatment devices are available:

- For four-stroke engines, there is the optional Alfa Laval Eliminator, a high-efficiency centrifuge installed on the back-flush line of the Alfa Laval 290 filter. The Alfa Laval Eliminator

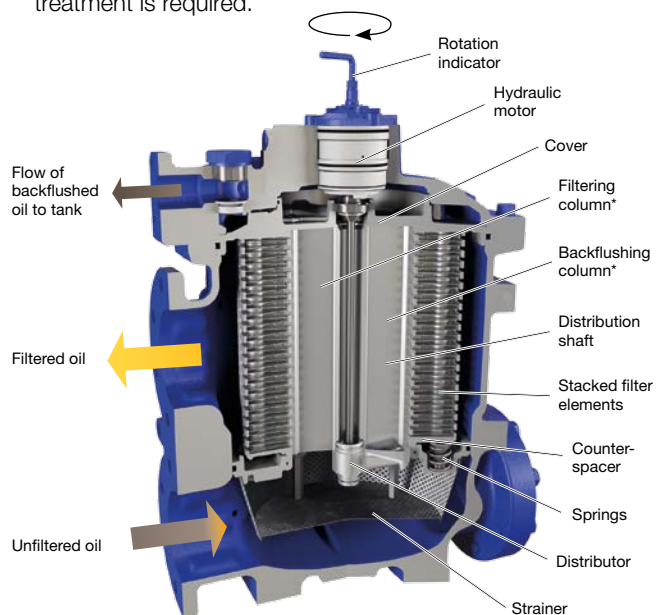


QP = Lubricating oil pump capacity
 Q1 = Maximum capacity of the filter
 Q2 = Hydraulic control oil flow to the engine
 Q3 = Flow of backflushed cleaned oil
 QE = Lubricating oil flow to the engine

Figure 5. Schematic diagram of a two-stroke engine system using hydraulic control oil.

removes contaminants up to four times more efficiently than a traditional bypass centrifuge and increases the service life of lubrication oil by up to three to four times.

- For two- and four-stroke engines, there is the optional integrated diversion chamber, which is an automatic second-stage filter. Unlike cartridge backflush treatment systems, the Alfa Laval diversion chamber does not require frequent spare replacement, and no additional tank for treatment is required.



* One of the total of 16 columns, 15 of which are used for full-flow filtration and one for backflushing.

Figure 6. Cross-section of an Alfa Laval 290 filter.

Options

- Single or duplex version
- Sludge removal devices (Eliminator or diversion chamber)
- Custom housing
- Counter-flanges included in delivery; connection size upon request
- Pressure drop indicator, transmitter and gauges
- Manual drain valve, automatic valve upon request

Certifications

BV, LRS, DNV-GL, ABS, CCS, KR, NK, MRS, RINA.
CE, ATEX upon request.

Technical data

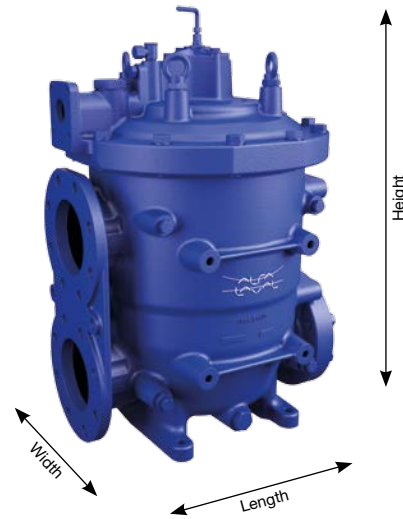
The size, weight, flow rate and/or working condition of the Alfa Laval 290 filter are highly dependent upon the application. The information below provides an indication of technical data for the filter. Contact Alfa Laval with more detailed information about your filtration requirements so that we can provide you with a suitable solution for your filtration requirements.

Engine type	Oil type	Filtration grade
Two-stroke	Hydraulic control oil	6 μm
	Main lubricating oil	34, 45 μm
Four-stroke	Lubricating oil	25, 34, 45 μm
All	Fuel oil	6, 10, 25, 34, 45 μm

Filtration	Down to 6 μm abs
Normal filter outlet pressure	0.8~6 bar (10~90 psi)
Min. filter outlet pressure	0.8 bar (10 psi)
Max. filter inlet pressure	7~12 bar (100~180 psi)
Test pressure	24 bar (350 psi)
Max. viscosity	130 cSt
Max. temperature	70~100°C (150~210°F)
Alarm (pressure drop)	0.8 bar (10 psi)
Backflushing flow	Down to 3%
Housing material	Cast iron
Filter medium material	Stainless steel

The dimensions shown below are for a standard model. Depending on the surface area and number of filter elements required for your application, the size of housing will vary. Therefore, the overall size of the filter will be different.

Dimensions (standard)	mm	in
Length	520	20.5
Width	430	17
Height	680	26.5





Lube oil filter – 350 series

Continuously automatic backflushing lube oil filter

Application

The automatic filter 350 is designed specifically for full-flow filtration of lubricating oil used in large engines that burn all types of fuels (distillate, Gas, DO, bio-fuels and HFO) dedicated to high capacities.

The 350 is intended for protection of:

- Main lubrication system on crosshead and trunk piston engines
- Servo or control oil systems in crosshead engines

The 350 requires minimal investment yet delivers:

- Highly reliable operation with minimal running costs
- True peace of mind

Unique features

- Robust disc-type filter elements
- Constant pressure drop across the filter
- Backflushing process driven by filtered oil
- Compact and simple design
- Suitable for combination with backflushing cleaning by a centrifugal separator, such as the Alfa Laval Eliminator
- Optional integrated backflushing treatment system: Diversion Chamber

Key benefits

- Simple design – Few components make maintenance easy and operating costs low
- Environmentally friendly – Minimal oil loss, extended oil life-time and no disposal items
- Durable – Robust design reduces the risk of the filter element cracking
- Easy maintenance – Continuous backflushing prevents adhesion of retained solids to the filter surfaces, which results in:
 - No manual cleaning of the filter elements
 - Low and constant pressure drop across the filter elements, which further reduces the risk of cracking
- Easy to troubleshoot – Constant pressure drop across the filter, combined with the pressure drop indicator, facilitates the detection of a malfunction in the lube oil system
- Self-sufficient – Use of filtered oil for the backflushing process eliminates the need for auxiliaries power (no air or electricity required)
- Constant pressurized flow – Combination with a back-flushing treatment system, such as a centrifuge or diversion chamber, is possible
- No need for a sludge treatment unit – The diversion chamber collects the particles backflushed from the full-flow chamber and cleans itself to concentrate sludge, acting as an automatic and maintenance-free sludge treatment system. This eliminates the need for any consumable items or manual cleaning system.



Alfa Laval lube oil filter 350

Working principle

Overview

The oil to be filtered is pumped from the lube oil sump through the filter and to the engine.

When the oil reaches the filter, it first passes through a strainer located in the inlet body. This removes any large foreign particles, such as pieces of rags.

Once past the strainer, the oil then passes through the full-flow filter elements, which trap solids, and onwards to the engine. A small amount of the filtered oil (3 to 5% of the flow to the filter) is used to backflush part of the full-flow filter elements and to drive the hydraulic motor.

The backflushed oil with solids from the full-flow chamber is then fed to the lube oil sump or the lube oil tank.

Filtering in the full-flow chamber

1. Unfiltered oil enters the filter at (A), flows through the strainer (S) and through the openings in the distribution cover (G), which are not tapped by the distributor (C) into the chambers (B). These chambers (B) are the independent fluid columns formed when stacking the full-flow elements (D).
2. The oil is distributed through the full-flow filter elements (D) into 14 of the 16 filtering columns. Solids are trapped on the inner side of the elements in the filtering columns.
3. The filtered oil flows into the full-flow chamber (E) and is fed through the filter outlet (F) to the engine.
4. A portion of the filtered oil is routed from the full-flow chamber (E) to the hydraulic motor (H) to drive the distributor (C).

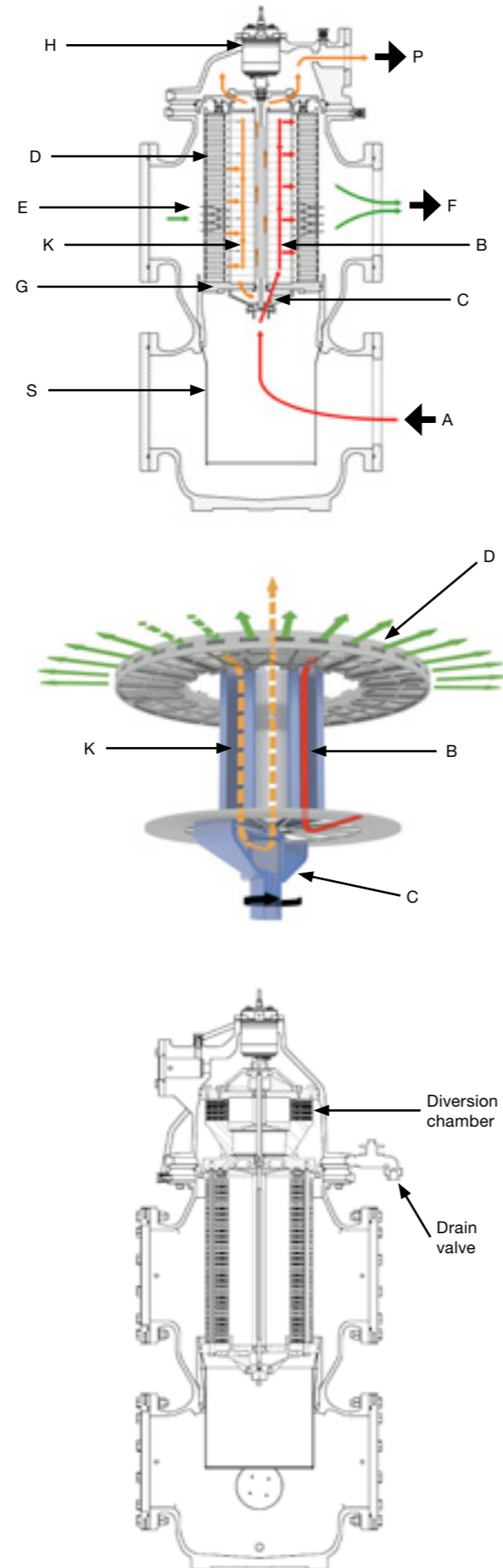
Backflushing in the full-flow chamber

1. While the full-flow takes place in the filtering columns (B), solids are removed from the elements in column (K) by backflushing (from outside to inside of the column) using part of the filtered oil from the full-flow chamber (E).
2. The backflushed oil from which solids have been removed flows through the column (K) up into the distributor (C) and is recirculated to the lube oil sump from the backflushed oil outlet (P).
3. For a filter with diversion chamber (optional):

The backflushed oil with solids from the full-flow chamber is led to the diversion chamber where it is filtered again, before it is led back to the lube oil sump.

The filter elements in the diversion chamber are backflushed (with filtered oil) in the same manner as in the full-flow chamber.

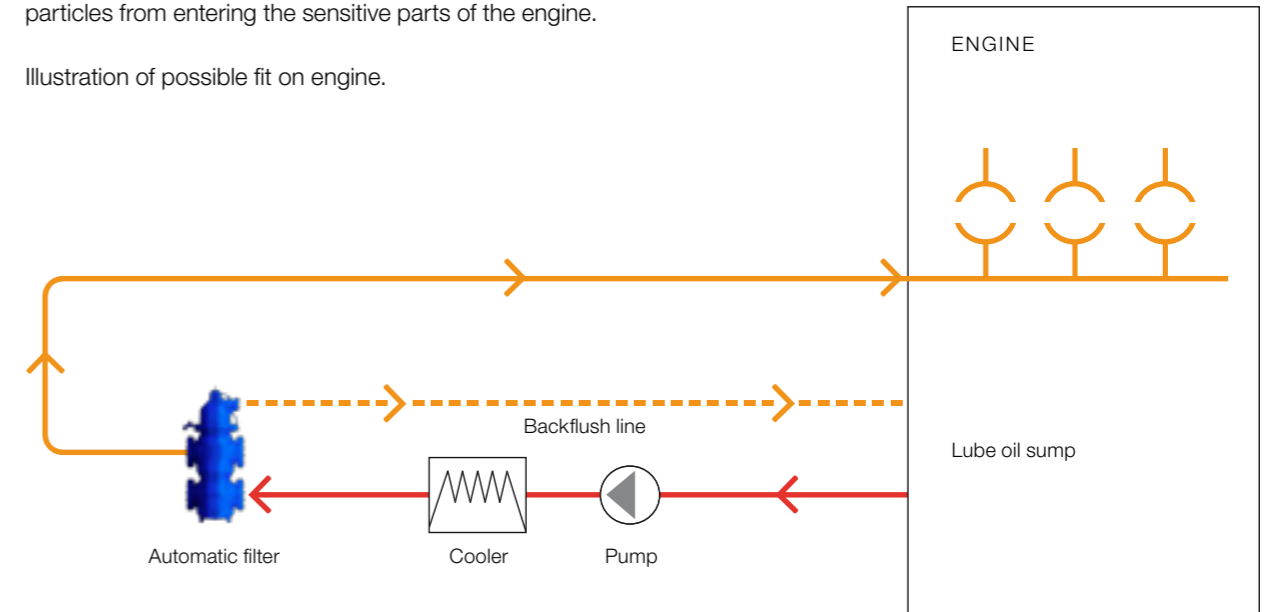
The solids concentrated in the diversion chamber are discharged.



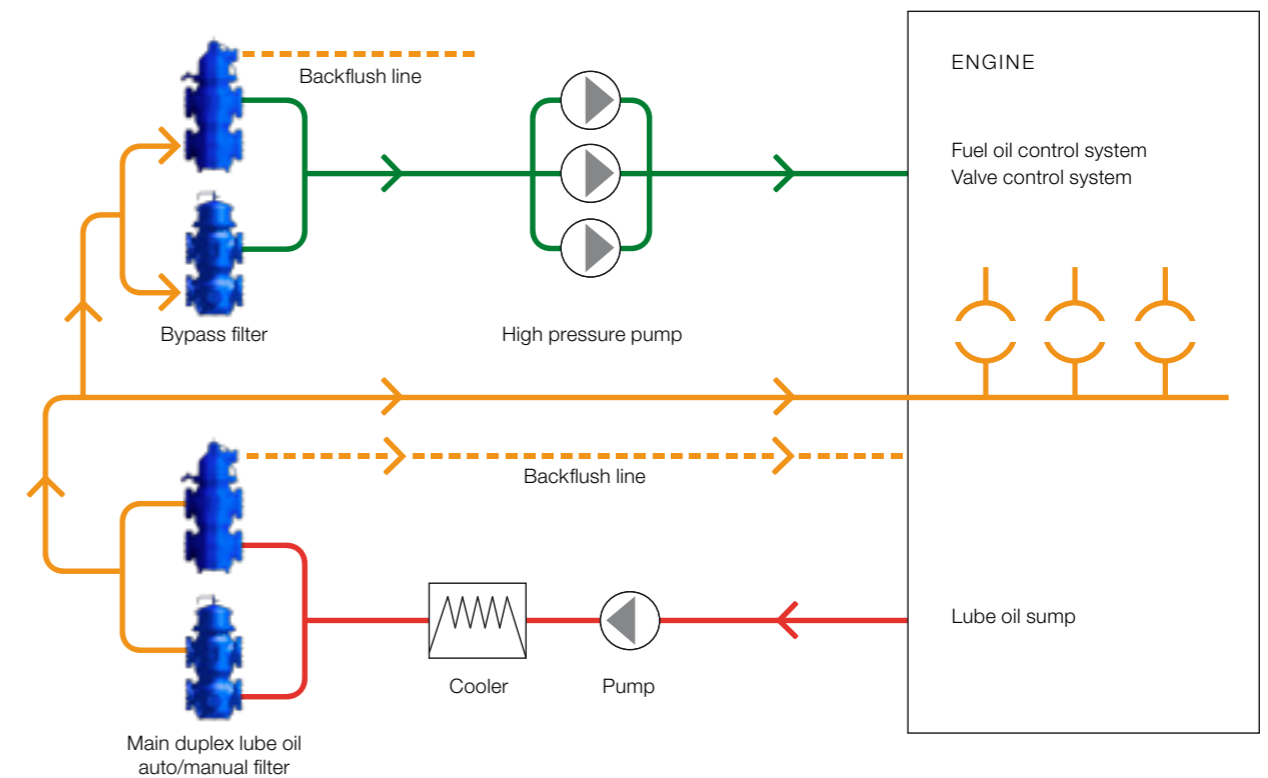
Engine protection

The filter is installed to receive the entire flow of lube oil, and as close to the engine as possible to prevent harmful solid particles from entering the sensitive parts of the engine.

Illustration of possible fit on engine.

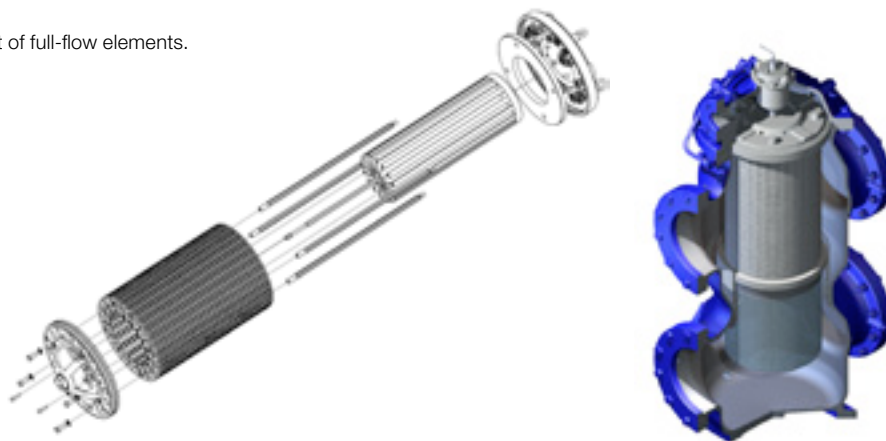


Flow diagram of the 350 filter in main lubrication system of crosshead and trunk piston engines.



Flow diagram of the 350 filter in the servo or control oil line of the main engines served by the lube oil system.

Arrangement of full-flow elements.



Other Alfa Laval filtration products

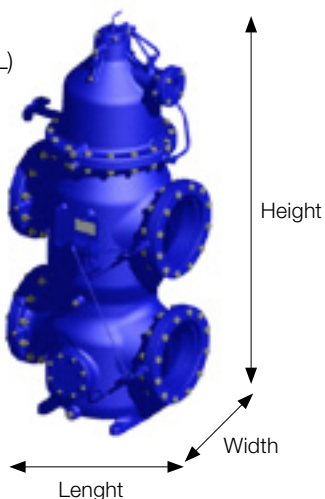
Alfa Laval manufactures filters for other engine room applications, such as automatic filters both with and without diversion chambers for lubricating oil and fuel oil, and manual and bypass filters. Alfa Laval also manufactures centrifuges to fit self-cleaning filters.

Service and support

Replacement components and service are provided through a network of Alfa Laval subsidiaries and representatives worldwide, including Marine Service Centres in all major ports.

Main technical data

Overall dimensions (W x H x L)
720 x 1853 x 662 mm



Technical data

Flow capacity	Up to 1200 m ³ /h
Filter finess	10 to 45 µm (absolute)
Max. filter inlet pressure	12 bar
Max. temperature in the filter	100°C
Housing material	Nodular cast iron

Technical documentation

Complete documentation on the main components and the installation, operation and maintenance of the filter is contained in the Instruction Book that accompanies the delivery of every Alfa Laval filter. Your local Alfa Laval company will be able to provide more details on the application and sizing of Alfa Laval automatic filters.

Installation

All Alfa Laval automatic oil filters are designed for installation in the engine room.

Standard equipment

Flanges supplied according to DIN standards (JIS available as an option)
Pressure drop indicator with alarm switch

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