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АВТОМАТИЧЕСКИЕ ФИЛЬТРЫ С ОБРАТНОЙ ПРОМЫВКОЙ

Eliminator – CCU

Combined cleaning unit for lube oil treatment



The Eliminator.

The Eliminator is an optimized lube oil treatment solution, combining two high performance Alfa Laval technologies:

- Full-flow automatic filter for collecting abrasive particles.
- High efficiency disc stack centrifuge removing particles from the backflush oil before returning to sump.

Both components can be built into the same housing (Eliminator patented by Alfa Laval) or installed separately but operating in combination. For example:

- Mounted directly on the engine (for high speed engines), the housing being specifically designed for the engine block, and the unit promoted with the engine by the engine manufacturer.
- Remote mounted apart from the engine by means of flexible or rigid connexions.
- The filter and centrifuge installed as separate components for larger installations or where the flow-rates are higher, and connected by suitable pipework.

Advantages and benefits

- Eliminates full-flow and bypass cartridge filters, and all the costs associated with the cartridge filters: purchasing, transport, handling, stocking, administration, oil losses, disposal of used cartridges.
- Increased engine availability – no engine stop for filter cartridge change.
- No filter bypass – the engine has 100% protection. In case of failure of one engine component, the remaining engine parts are protected from any resulting contamination returning through the LO system, by the full flow filter.
- Sealed lube oil circuit – the lube oil circuit remains sealed: no risk of contamination entering the system, or of oil leakage and spillage occurring.
- Reduced maintenance costs.
 - The centrifuge requires cleaning up to every 2500 hours by the replacement of a paper insert.

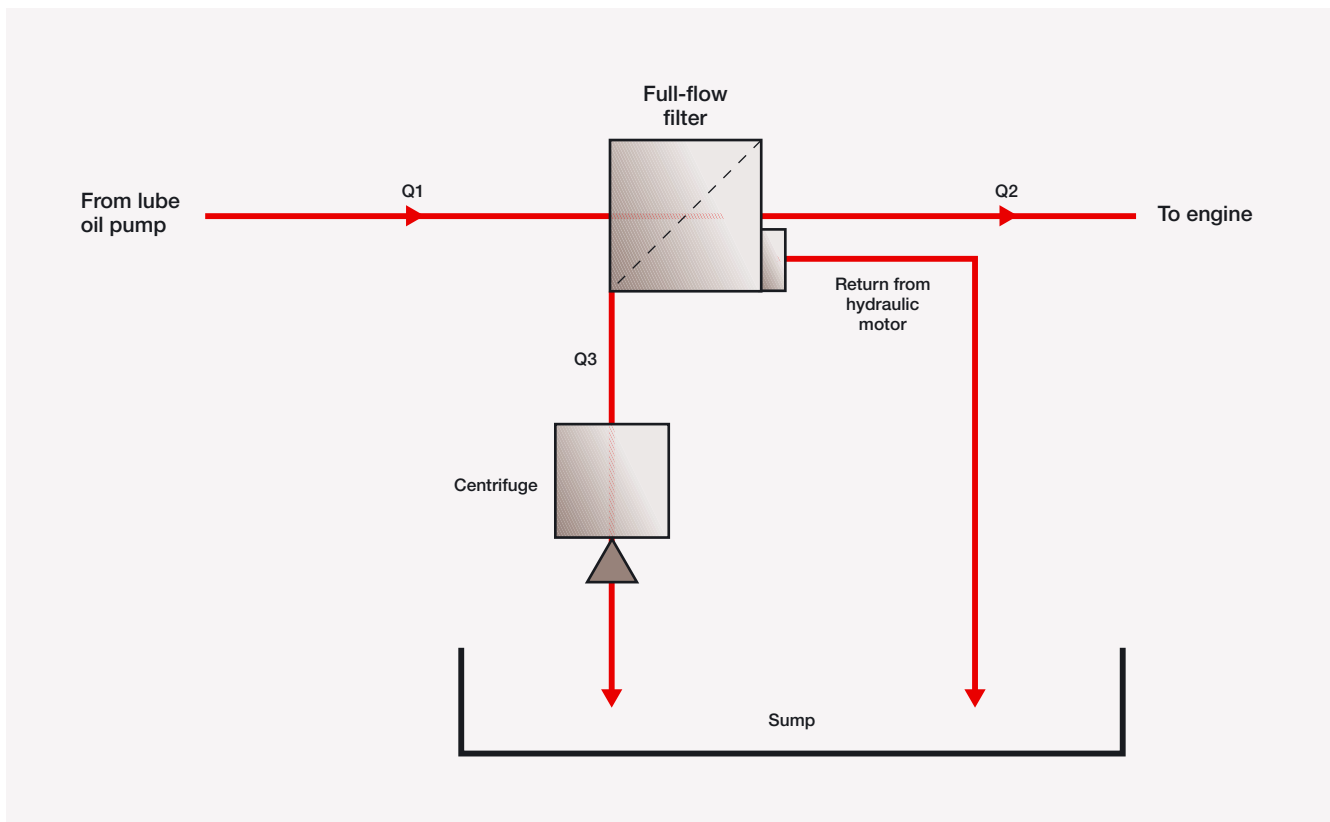


– The filter requiring service during the normal engine service interval and overhaul. At this time only a set of O-rings is required.

speed engine-builder customers has shown that it is possible to double the lifetime of the lube oil, through close oil sample analysis.

- Increased oil life-time – the high efficiency of the centrifuge compared to cartridges, keeps the lube oil cleaner, hence increasing its operational life. Our experience with some high-

- Environmentally-friendly solution due to no oil loss, no cartridge disposal, reduced risk of oil spillage and the possible extended operating life of the engine lube oil.



Flow diagram of the Eliminator.

Full-flow automatic filter (A)

The automatic filter is made up of a number of filter disc elements, each element composed of two identical halves. The number of elements required is defined to meet each application.

The stainless steel filtering mesh is contained inside two supporting mesh, giving an element with a long operating life-time. This is one key part to the low life-cycle cost of the unit.

The rigid frame of each element is made in die-cast aluminium. This frame has a number of radial ribs separating each element into 8 or 12 sectors depending on the element size.

The oil passes through the element from the inside to outside, via the holes on the inside edge of the element. The particles are stopped and are trapped on the mesh.

The elements are stacked on top of each other, and hence the ribs form a collection of independent sectors or columns.

A rotating distributor set inside the disc stack assures the backflushing of each sector in turn by clean oil and is driven

by a hydraulic motor (B). This motor itself is driven by oil pressure and slowly rotates the distributor, ensuring the complete and continuous backflushing of the filtering surface area.

The rate of backflushing flow is regulated by the centrifuge (3–5% of the LO flow-rate).

Centrifuge (C)

The centrifuge is made up of a rotor (or bowl) spinning on a shaft, driven by the pressure of oil which is forced from two nozzles which are at 180° positions around the body. This rotation is achieved due to the pressure difference from the inlet to outlet sides of the centrifuge.

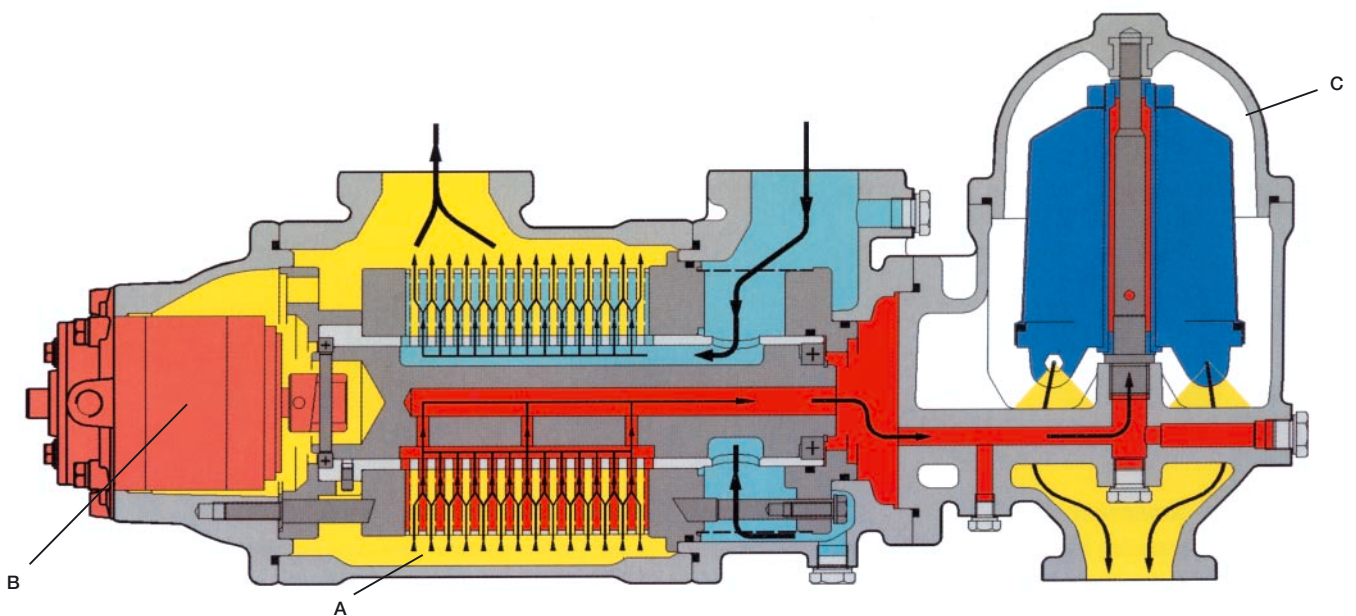
The rotor contains an Alfa Laval disc stack which enhances the performance of the centrifuge by between 6–8 times compared to a similar centrifuge with no discs.

Particles down to 2 µm and below in size are retained on the rotor wall, when the relative specific density of the particles to that of the oil allows. A paper insert allows for simple removal of the contaminants collected on the wall of the centrifuge rotor.

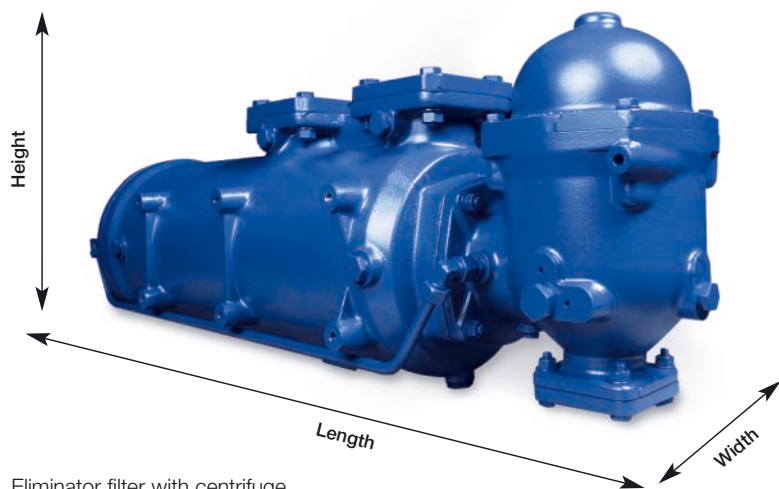
The combined filter and centrifuge product

The full-flow filter and the centrifuge can be installed in combination in a shared housing (as shown below), the backflush flow of the filter feeding the centrifuge, where it is cleaned prior to returning to the engine sump.

Depending on the engine, the Eliminator housing can be adapted for direct engine-mounting in place of the existing filters, or installed separately from the engine itself and connected through suitable pipework.

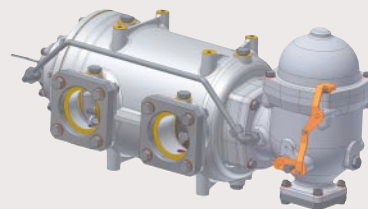


The Eliminator filter.



Eliminator filter with centrifuge.

Option: Eliminator with clutchable centrifuge, allowing cleaning or replacement of the centrifuge, without stopping the engine.



Product range

Model	Q m ³ /h	L × W × H (mm)
180-14	to 30	884 × 252 × 393
180-20	to 35	956 × 252 × 393
240-12	to 45	904 × 340 × 422
240-18	to 65	988 × 340 × 422
240-24	to 85	1072 × 340 × 422
240-30	to 90	1156 × 340 × 422
240-36	to 90	1240 × 340 × 422

Applications

Products suitable for lube oil treatment for engines burning HFO, DO, distillate or gas fuels. Suitable for retro-fit installation.

Technical documentation

Complete information and documentation for the main components and the installation, operation and maintenance of the filter is contained in the Instruction Book that accompanies delivery of each 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.

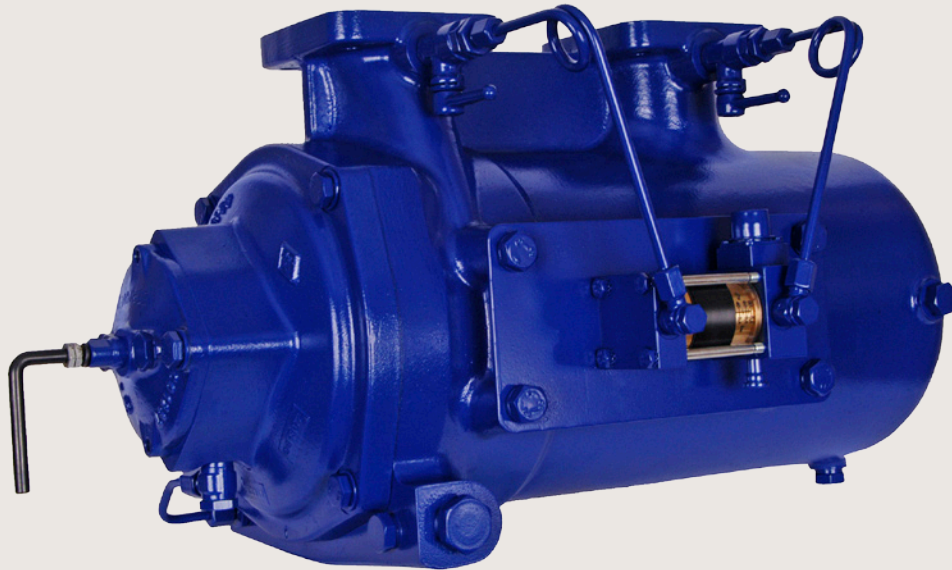
Technical data

Data	Value
Max. filter inlet pressure	12 bar
Min. filter outlet pressure	3 bar
Normal filter outlet pressure	3.5–6 bar
No counter pressure allowed on centrifuge	–
Max. viscosity in the filter at normal operation	75 cSt
Max. continuous temperature in the filter	120°C
Normal ΔP (inlet to outlet)	0.2–0.5 bar
Alarm ΔP	0.8 bar
Back-flushing flow (% of pump capacity)	3–5%
Mounting position	Horizontal
Test pressure	18 bar
Housing material	Aluminium



Lube oil filter – T-160 range

Continuously automatic backflushing lube oil filter



Lube oil filter T-160

Application

The automatic filter T-160 is designed specifically for full-flow filtration of lubricating oil used in engines that burn all types of fuels (distillate, Gas, DO, bio-fuels and HFO).

The T-160 is intended for protection of:

- the main lubrication system on small and medium speed engines
- servo or control oil systems on 2-stroke engines
- turbocharger lubrication systems

The T-160 requires minimal investment and yet delivers:

- highly reliable operation at minimal running costs
- true peace of mind

Unique features

- Robust disc-type filter elements
- Constant pressure drop across the filter
- Filtered oil drives the backflushing process
- Compact and simple design
- Suitable for cleaning backflushed oil in a centrifuge (Eliminator).

Key benefits

- **Simple design** – with minimum components facilitates maintenance and guarantees low operating costs.
- **Environmentally friendly** – no oil loss, extended lifetime of oil, no cartridge disposal.
- **Durable** – Robust design.
- **Easy maintenance** – Continuous backflushing significantly reduces adhesion of retained solids to filter surfaces, which results in:
 - No manual cleaning of 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.
- **Flexible installation:**
 - Backflush can be connected directly to centrifuge.
 - Use of filtered oil for the backflushing process eliminates the need for auxiliary power (no air or electricity).

Working principle

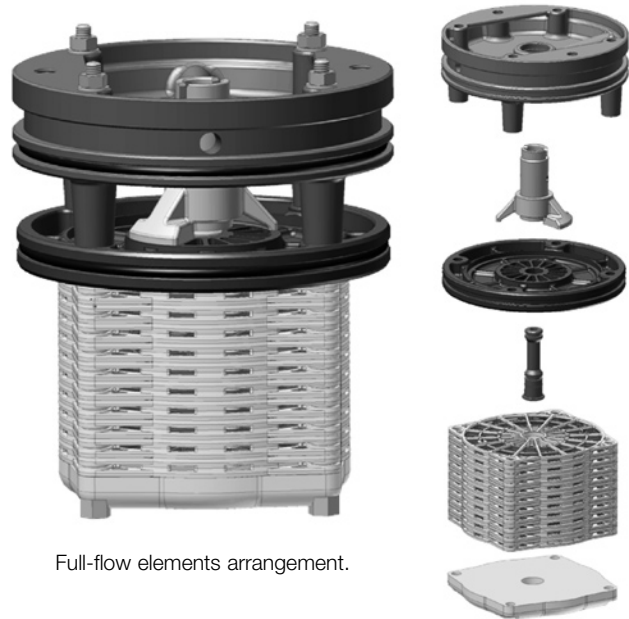
Overview

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

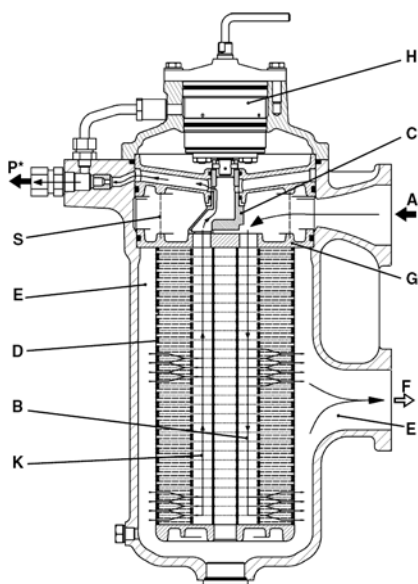
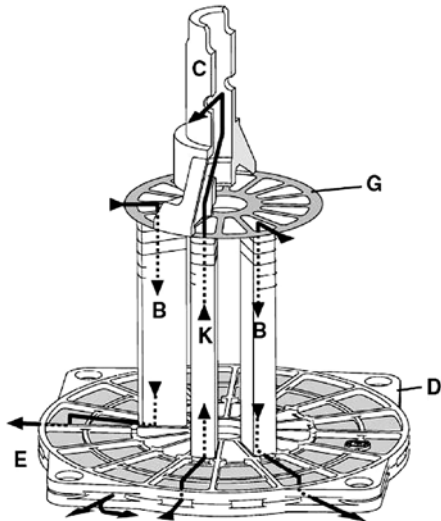
When the oil reaches the filter it first passes through a strainer located in the inlet body. This should remove any large foreign particles, such as pieces of rags that may have been left in the system after maintenance.

Once past the strainer, the oil then passes through the full-flow filter elements (where solids are trapped) and to the engine. A small part 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 led to the lube oil sump or to a centrifuge (Eliminator concept).



Full-flow elements arrangement.



Filtering in the full-flow chamber

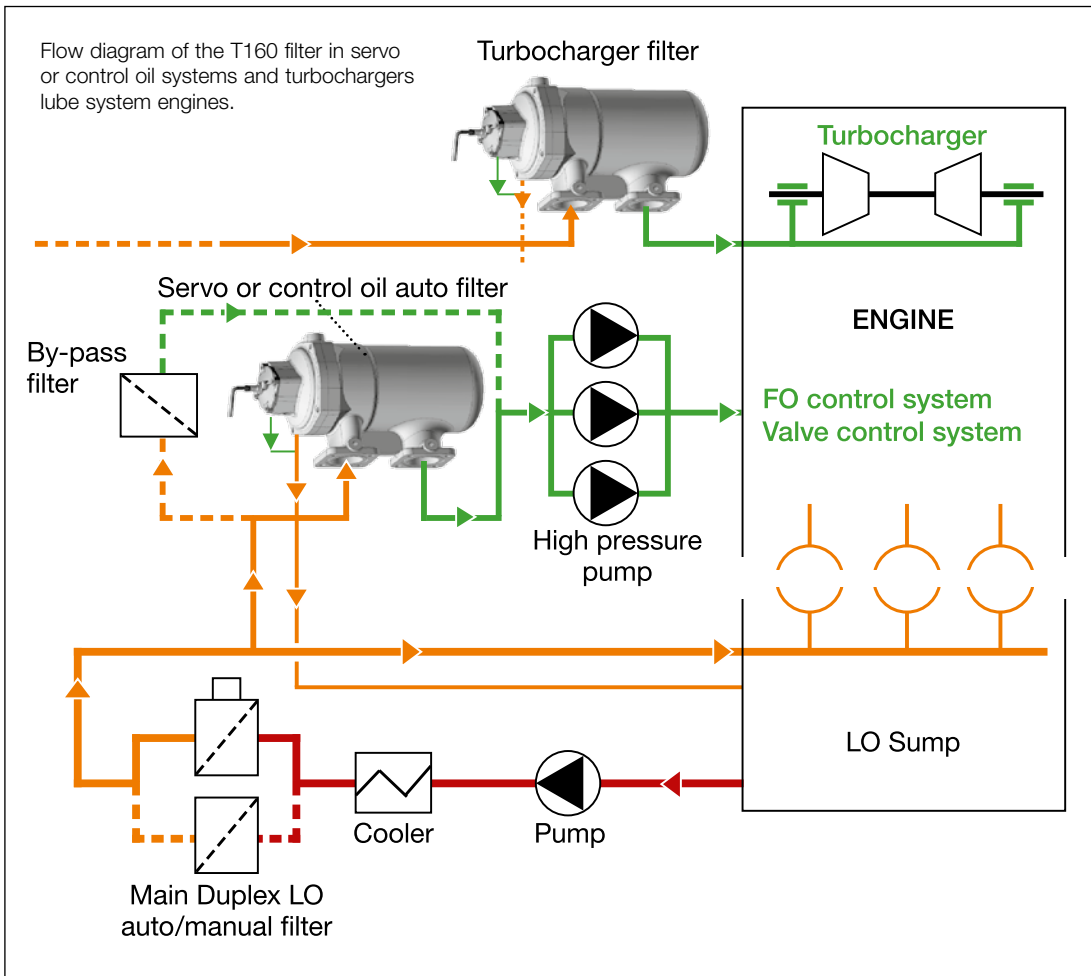
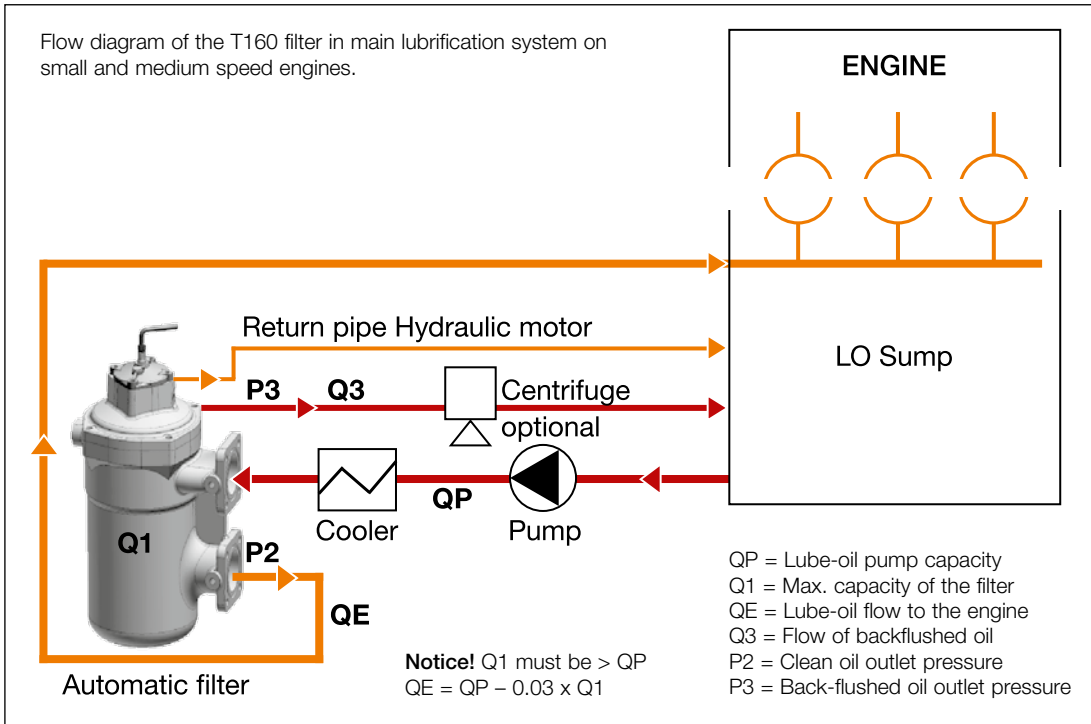
1. Unfiltered oil enters the filter at (A), flows through the strainer (S) and through the openings in the distribution cover (G) which are not tapped by the distributor (C) into the chambers (B) – these are the independent fluid columns formed when stacking the full-flow elements (D).
2. The oil is distributed through the full-flow filter elements (D) into 14 of the 16 filtering columns. The 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).

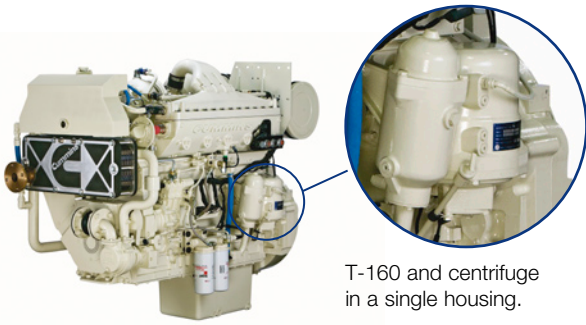
Backflushing in the full-flow chamber

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 with removed solids flows through column (K) up into the distributor (C) and is recirculated to the lube oil sump from the backflushed oil outlet (P).

Engine protection

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





T-160 and centrifuge in a single housing.



T-160 and centrifuge as separate components.

T-160 full flow filter combined with centrifuge (Eliminator)

The T-160 lube oil filter is fully suitable for cleaning of back-flushed oil by centrifuge.

The two components can be installed separately or specially combined into a single configuration for mounting on an engine block.

The combined configuration:

- Eliminates full-flow and bypass cartridge filters, and all the costs associated with the cartridge filters: purchasing, transport, handling, stocking, administration, oil losses, disposal of used cartridges.
- Reduces maintenance costs.
 - The centrifuge requires cleaning up to 2500 hours.
 - The filter requires service during the normal engine service interval and overhaul; currently only a set of O-rings are required.
- Increased oil lifetime – the high efficiency of the centrifuge compared to cartridges keeps the lube oil cleaner, hence increases its operational life. Oil sample analyses performed by customers who are high-speed engine builders has shown that it is possible to double the lifetime of the lube oil.
- Environmentally-friendly solution – no oil loss, no cartridge disposal, reduced risk of oil spillage and the possibility to extend the operating life of the engine lube oil.

Other Alfa Laval filtration products

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

After-sales support

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

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 delivery of each 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

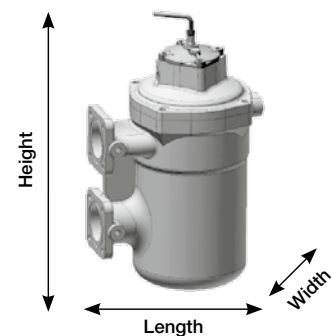
All Alfa Laval automatic oil filters are designed for installation in the engine room.

Standard equipment

Flanges according to DIN standards (JIS as option).
 Pressure drop indicator with alarm switch (option)
 Remote centrifuge with discs-stack (option)

MAIN TECHNICAL DATA

Flow capacity	up to 40 m ³ /h
Max inlet pressure	12 bar
Housing material	Aluminium as standard (cast iron available as well)
Filter mesh material	Stainless steel (AISI 316L)
Filter fineness	10 to 45 µm
Max. Temperature in the filter	100°C as standard. (125°C on request)
Overall dimensions	width 280 x height 590 x length 335 mm





Lubricating oil filter

Continuously automatic backflushing lubricating oil filter

The automatic filters, T150, T280 and X280, are designed specifically for full-flow filtering of lubricating oils for trunk piston and crosshead engines.

Unique features

- Robust disc-type filter elements.
- Continuous backflushing.
- Filtered oil drives the backflushing process.
- Constant pressure drop across the filter.
- Compact and space-saving design.

Key benefits

- Robust design reduces risk of filter element cracking.
- Continuous backflushing significantly prevents adhesion of retained solids to filter surfaces, which results in:
 - No manual cleaning of filter elements.
 - Low and constant pressure drop across the filter elements, which further reduces the risk of cracking.
- Robust filter elements and continuous backflushing ensure safe protection of the diesel engine, with normally more than 12,000 operating hours between cleaning and inspection of the filters.
- Use of filtered oil for backflushing process eliminates the need for external power supply and compressed air.
- Constant pressure drop across the filter, combined with the pressure drop indicator, facilitates detection of malfunctions in the lubricating oil system.
- Easy to install and to retrofit as an upgrade to existing installations.



Lubricating oil filter: Protector X280.

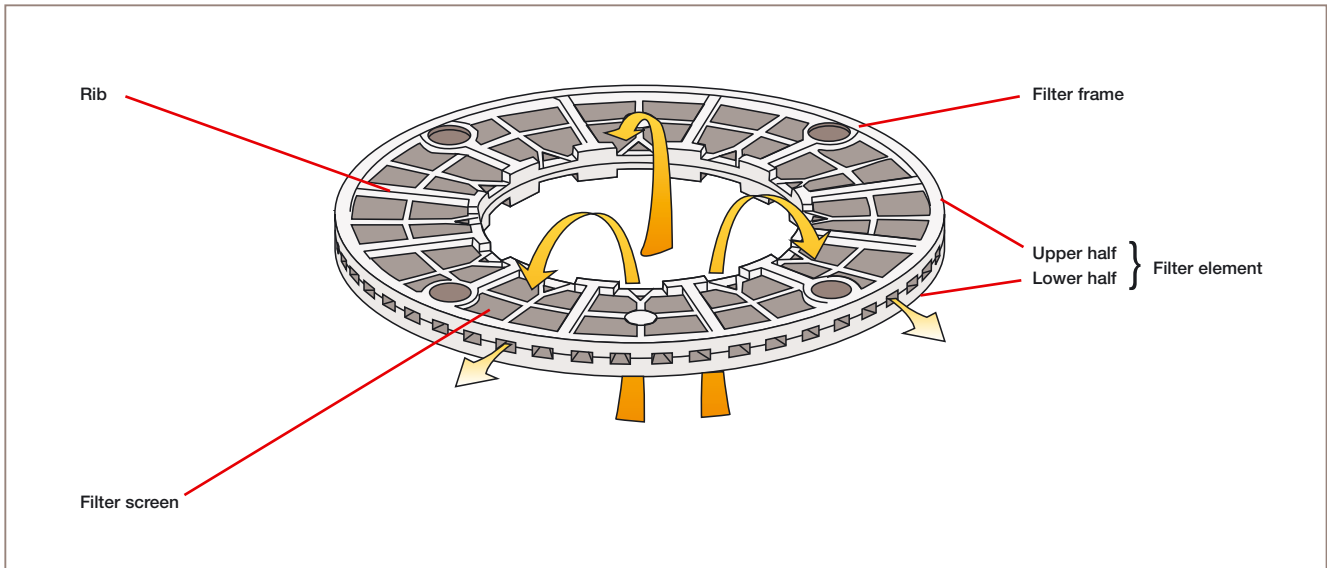


Figure 1. Full-flow element: Flow direction through one filtering element (Filtration).

Diesel engine protection

The filter is installed in the full-flow system as close to the engine as possible to prevent harmful solid particles entering the sensitive parts of the engine.

The separator is installed in the bypass system. Its function is to remove harmful contaminants (solid particles and water) from the lubricating oil system.

Design

The filter elements are assembled into a disc stack. The filter elements comprise a filter frame and filter screen, and are divided into sections by ribs.

The discs, with sleeve, guide rods, springs and flanges, are mounted over the distributor to form the filtering unit. The sections, divided by the ribs, form twelve independent filtering columns.

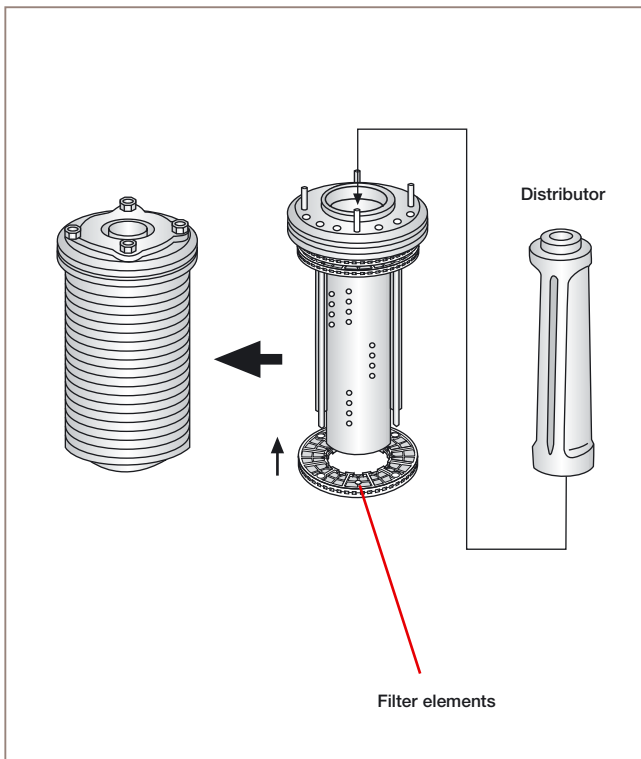


Figure 2. Filtering unit.

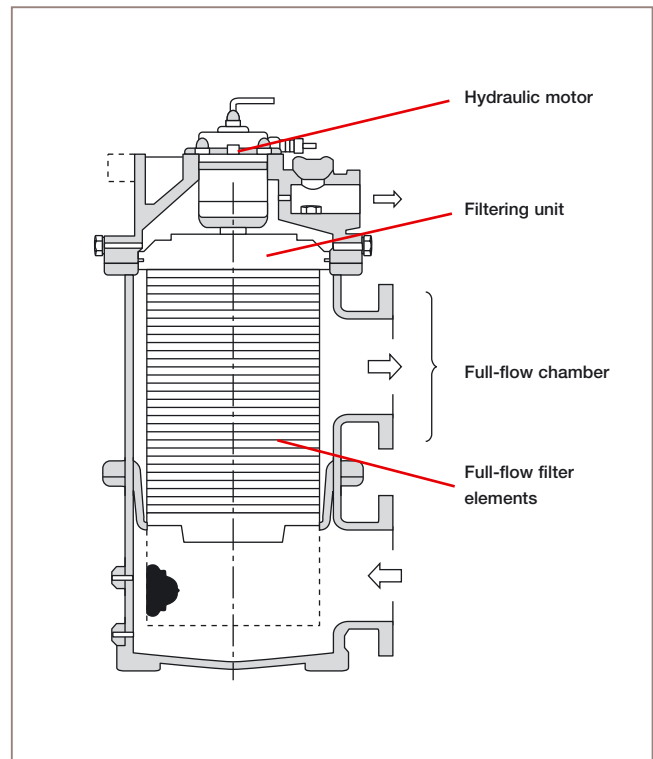


Figure 3. Fully assembled filter showing filtering unit and hydraulic motor.

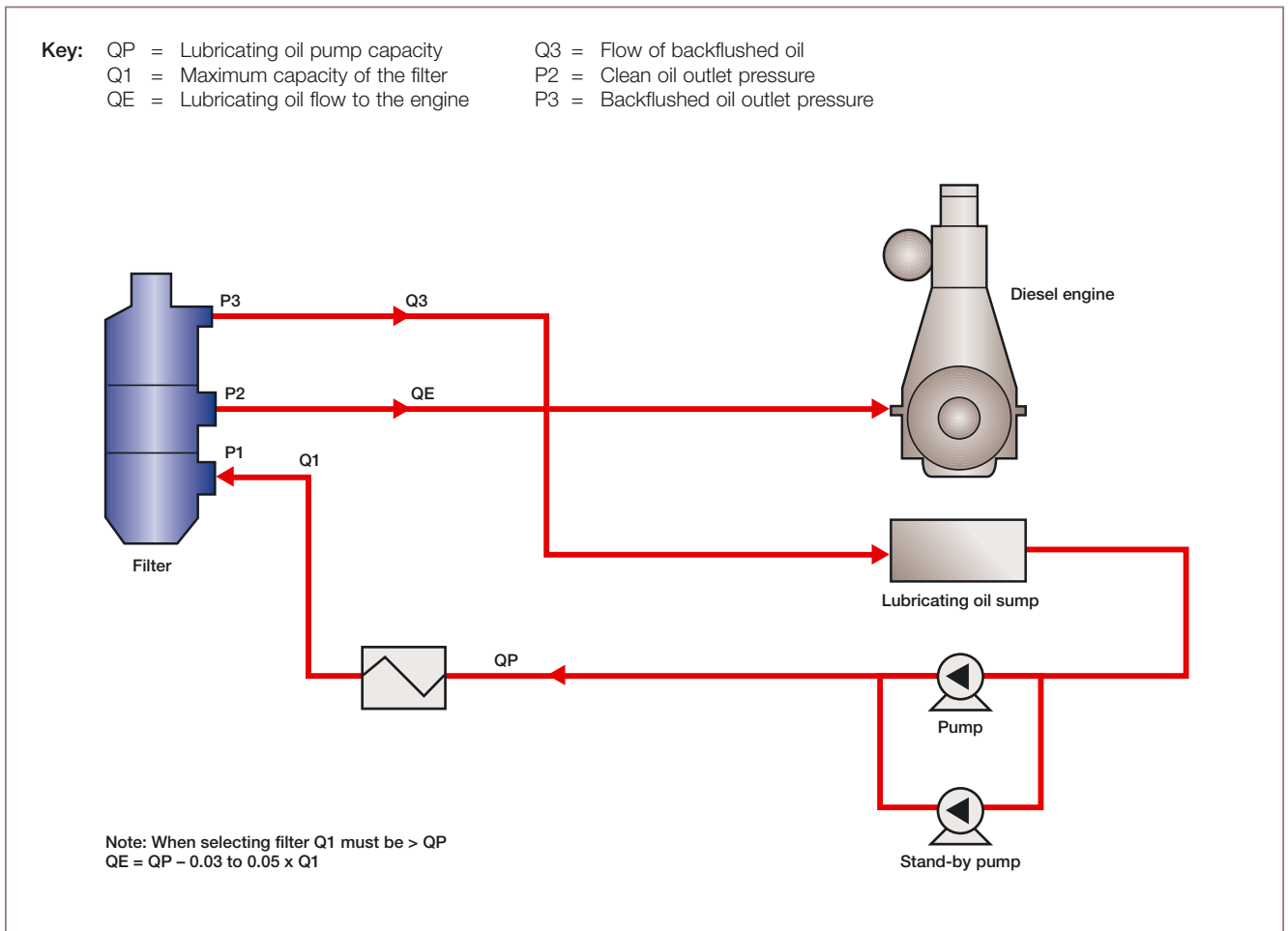


Figure 4. Protector automatic lubricating oil filter showing pressure, flow and capacity.

Operating principle

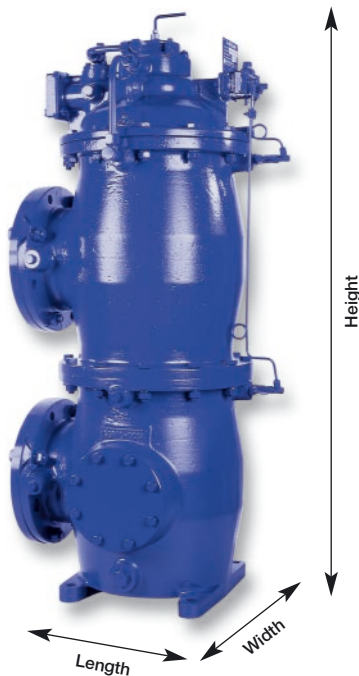
The unfiltered oil entering the filter is fed by the distributor to 11 of the 12 filtering columns. Solids are collected on the filter surface and the filtered oil flows to the engine. Previously collected solids are removed in the twelfth column by back-flushing with a small amount of the filtered oil. This is taken through a passage in the distributor via the backflushed oil outlet and back to the lubricating oil sump.

The distributor, which is driven by the hydraulic motor on top of the filter housing, rotates at regular intervals to feed oil for filtration in 11 columns and to backflush in the twelfth. In this way, all the columns are backflushed once per full rotation of the distributor, which corresponds to every one to three minutes.

The pressure drop indicator connected between the inlet and outlet of the filter provides a reading and signals an alarm condition if for any reason the pressure drop reaches the alarm level. This indicates that there is a problem in the lubricating oil system.

The driving force for the automatic backflushing is the pressure difference between the clean oil outlet (P2) and the backflushed oil outlet (P3) of the filter. A flow sheet illustrating the pressures, flows and capacities is shown in Figure 4.

A pressure drop indicator, inspection covers and counter flanges are provided as ancillary equipment. Options exist for additional features, such as magnetic plates installed on the inlet housing.



Installation

All Alfa Laval automatic lubricating oil filters are designed for installation in the engine room. Counter flanges are according to DIN standards (JIS as option).

Other Alfa Laval filtration products

Alfa Laval also manufactures filters for other engine room applications, such as automatic fuel oil filters, and manual indicator and bypass filters.

After-sales support

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

Dimensions

Lubricating oil flow (m ³ /h)		Height × Length × Width (mm)
Crosshead	Trunk piston	
40–150	20–100	750 × 450 × 450
150–250	100–220	1300 × 500 × 500
250–500	220–450	1300 × 1050 × 500
500–800	450–700	1300 × 1500 × 500
800–1100	–	1300 × 2100 × 500

Guideline to overall dimensions

Depending on the surface area and number of filter elements required for your application, the number of housings will vary, and hence the overall size of the filter will be different.

Filtration fineness

This can be defined depending on diesel engine requirements and the specific application.

Technical documentation

Complete information and documentation for the main components and the installation, operation and maintenance of the filter is contained in the Instruction Book that accompanies delivery of each 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.

Technical data

	Crosshead X280	Trunk piston T150, T280
Normal filter outlet pressure	2–3 bar (P2 norm)	3.5–6 bar (P2 norm)
Min. filter outlet pressure	1.4 bar	3 bar
Max. filter inlet pressure	12 bar	12 bar
Test pressure	24 bar	24 bar
Max. viscosity in filter at normal operation	130 cSt	75 cSt
Max. temperature in the filter	100°C	100°C
Alarm Δp	0.9 bar	0.8 bar
Backflushing flow	3% of filter inlet flow	3–5% of filter inlet flow
Housing material	Nodular cast iron	Nodular cast iron
Filter screen material	Stainless steel	Stainless steel



Lubricating oil filter

Continuously automatic backflushing lubricating oil filter with diversion chamber

The automatic filters, T150D, T280D and X280D, are designed specifically for full-flow filtering of lubricating oils for trunk piston and crosshead engines.

Unique features

- Robust disc-type filter elements.
- Continuous backflushing.
- Filtered oil drives the backflushing process.
- Constant pressure drop across the filter.
- Compact and lightweight.
- Cleaning of backflushed oil by refiltration in the diversion chamber before return to the engine sump.
- Removal of particles collected from the system at the filter.

Key benefits

- Robust design reduces risk of filter element cracking.
- Continuous backflushing significantly prevents adhesion of retained solids to filter surfaces, which results in:
 - No manual cleaning of filter elements.
 - Low and constant pressure drop across the filter elements, which further reduces the risk of cracking.
- Robust filter elements and continuous backflushing ensure safe protection of the diesel engine, with normally more than 12,000 operating hours between cleaning and inspection of the filters.
- Use of filtered oil for backflushing process eliminates the need for external power supply and compressed air.
- Constant pressure drop across the filter, combined with the pressure drop indicator, facilitates detection of malfunctions in the lubricating oil system.



Lubricating oil filter: Protector X280D.

- Easy to install and to retrofit as an upgrade to existing installations.
- No need for a sludge treatment unit (consumable item or manual cleaning system). The diversion chamber collects the particles backflushed from the full-flow chamber and clean itself to concentrate sludge, acting as an automatic and maintenance-free sludge treatment system.

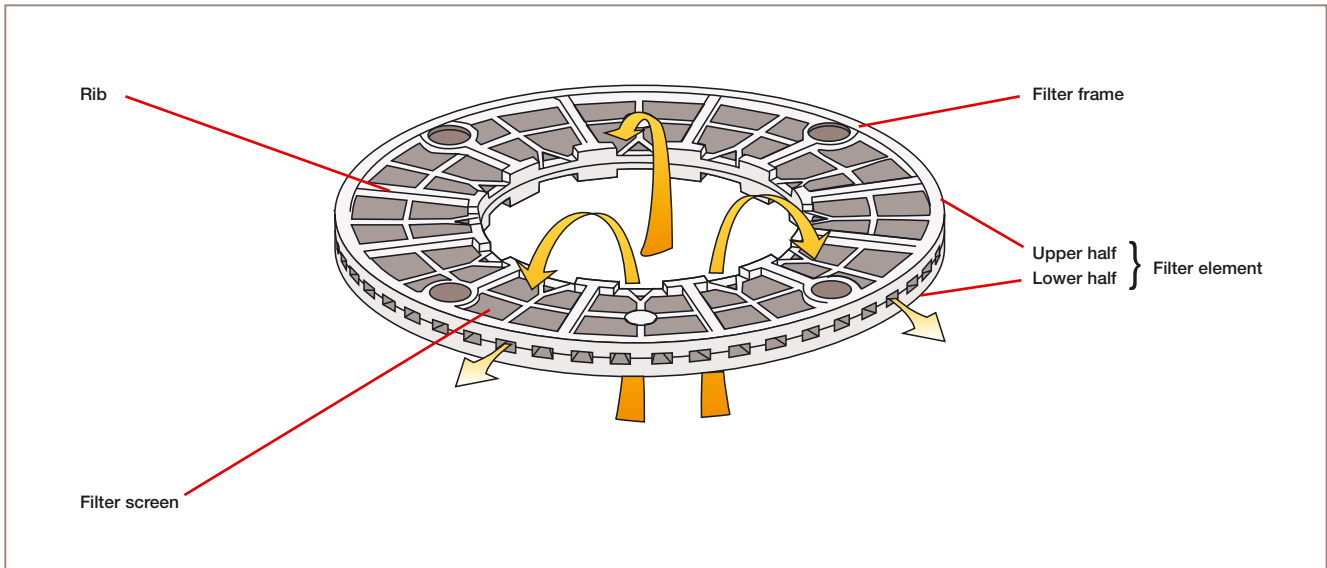


Figure 1. Full-flow element: Flow direction through one filtering element (Filtration).

Diesel engine protection

The separator is installed in the bypass system. Its function is the removal of harmful contaminants (solid particles and water) from the lubricating oil system.

The filter is installed in the full-flow system as close to the engine as possible to stop harmful solid particles that may not have been removed by the separator. These particles can then be removed from the system at the drain valve on the filters.

Design

Two types of filter elements, full-flow (Figure 1) and diversion elements, are assembled into a disc stack. The filter elements comprise a filter frame and filter screen. The elements are divided into sections by ribs.

The discs, with sleeve, guide rods, springs and flanges, are mounted over the distributor to form the filtering unit. The sections, divided by the ribs, form twelve independent filtering columns in the full-flow and in the diversion chambers.

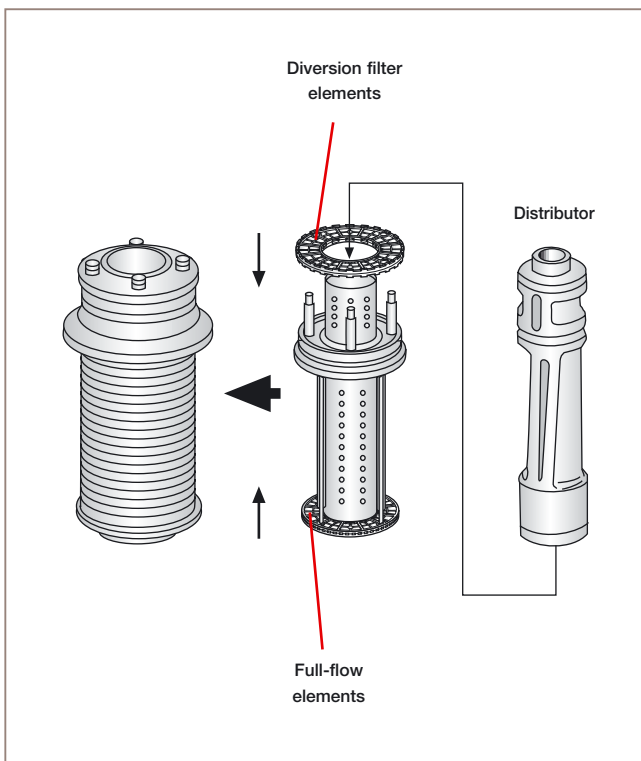


Figure 2. Filtering unit.

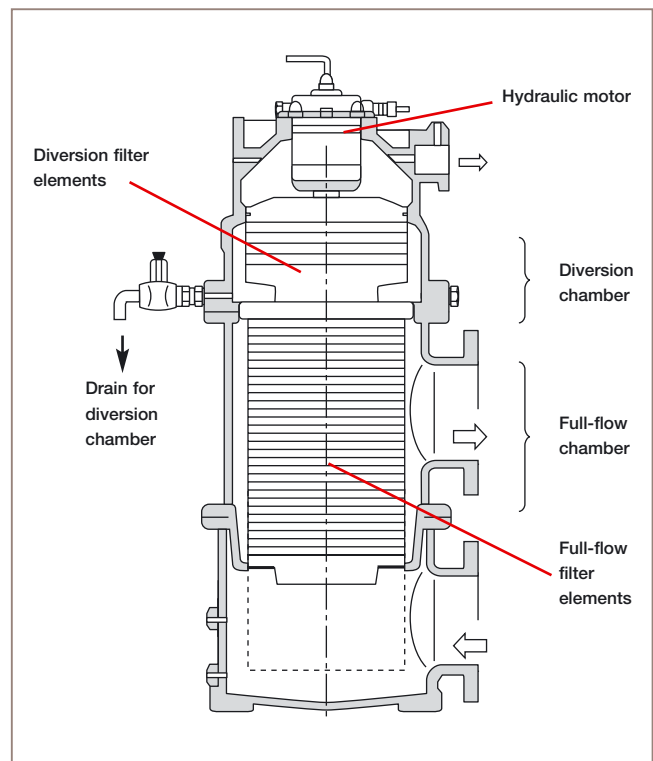


Figure 3. Fully assembled filter showing filtering unit and hydraulic motor.

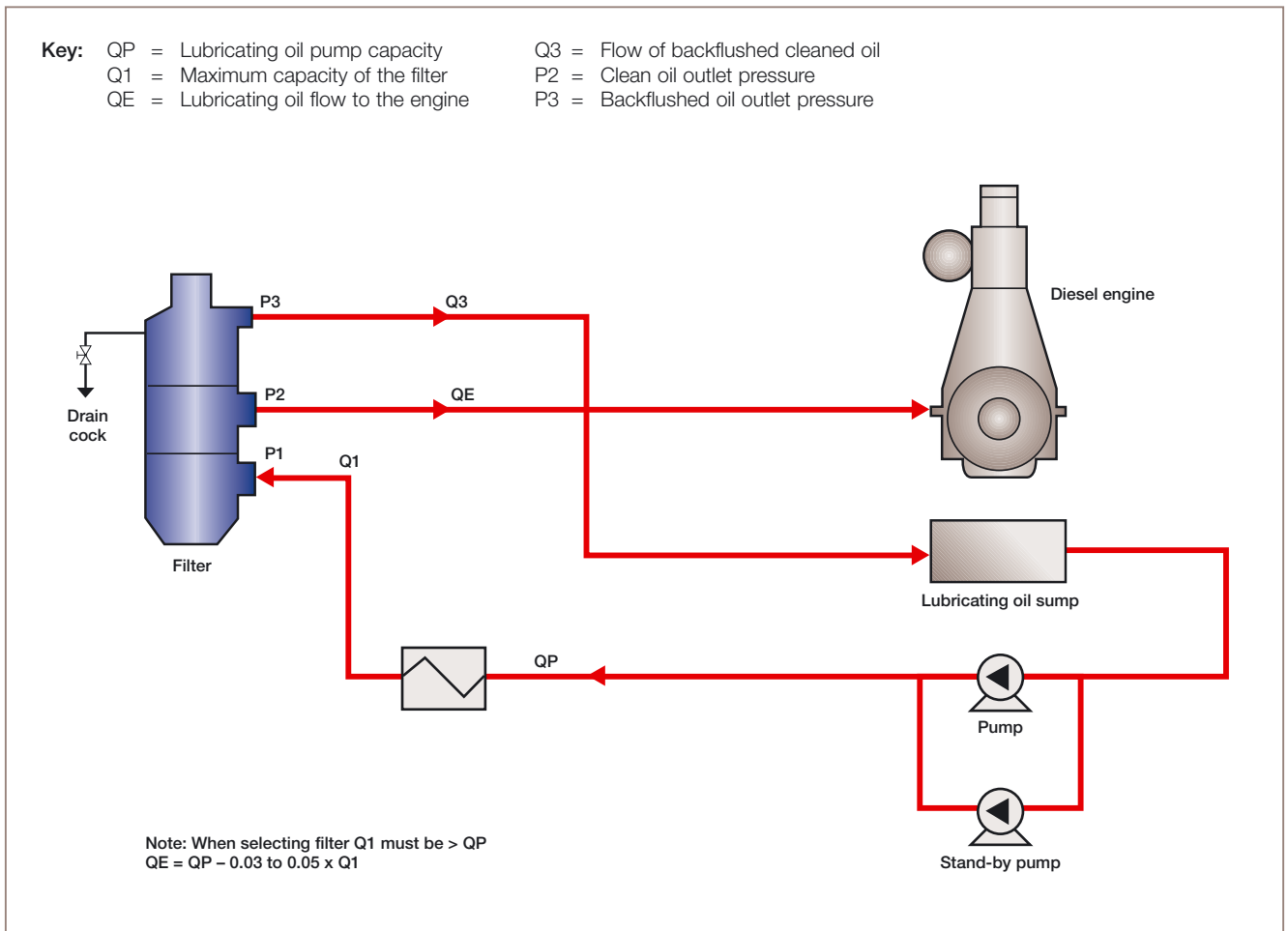


Figure 4. Protector automatic lubricating oil filter showing pressure, flow and capacity.

Operating principle

The unfiltered oil entering the filter is fed by the distributor to 11 of the 12 full-flow filtering columns. Solids are collected on the filter surface and the filtered oil flows to the engine. Previously collected solids are removed in the twelfth column by backflushing with a small amount of the filtered oil and taken through a passage in the distributor to the diversion chamber.

The distributor, which is driven by the hydraulic motor on top of the filter housing, rotates at regular intervals to feed oil for filtration in 11 columns and to backflush in the twelfth. In this way, all the columns are backflushed once per full rotation of the distributor, which corresponds to every one to three minutes.

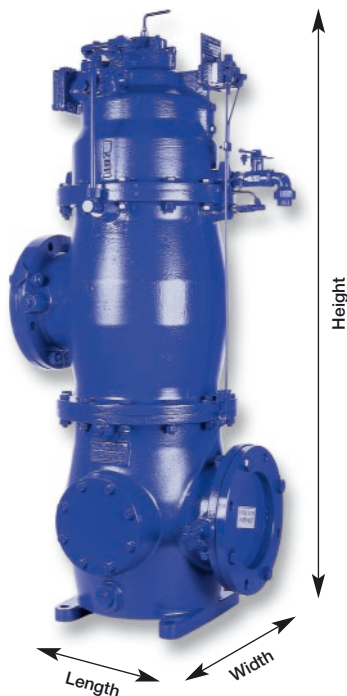
Backflushed oil is filtered in 11 of the 12 columns. Solids from the backflushed oil are directed to the diversion chamber. Cleaned backflushed oil is then led back to the lubricating oil sump. At the same time backflushing of the diversion chamber by clean oil takes place in the twelfth column and solids settle to the bottom of the diversion chamber, where they are discharged periodically through the drain cock.

The pressure drop indicator connected between the inlet and outlet of the full-flow chamber provides a reading and signals an alarm condition if for any reason the pressure reaches the

alarm level. This indicates that there is a problem in the lubricating oil system.

The driving force for the automatic backflushing is the pressure difference between the clean oil outlet (P2) and the backflushed oil outlet (P3) of the filter. A flow sheet illustrating the pressures, flows and capacities is shown in Figure 4.

The pressure drop indicator, drain cock, inspection covers and counter flanges are provided as ancillary equipment. Options exist for additional features, such as an automatic timer drain valve and magnetic plates installed on the inlet housing.



Installation

All Alfa Laval automatic lubricating oil filters are designed for installation in the engine room. Counter flanges are according to DIN standards (JIS as option).

Other Alfa Laval filtration products

Alfa Laval also manufactures filters for other engine room applications, such as automatic fuel oil filters, and manual indicator and bypass filters.

After-sales support

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

Dimensions

Lubricating oil flow (m ³ /h)		Height × Length × Width (mm)
Crosshead	Trunk piston	
40–150	20–100	750 × 450 × 450
150–250	100–220	1300 × 500 × 500
250–500	220–450	1300 × 1050 × 500
500–800	450–700	1300 × 1500 × 500
800–1100	–	1300 × 2100 × 500

Guideline to overall dimensions

Depending on the surface area and number of filter elements required for your application, the number of housings will vary, and hence the overall size of the filter will be different.

Filtration fineness

This can be defined depending on diesel engine requirements and the specific application.

Technical documentation

Complete information and documentation for the main components and the installation, operation and maintenance of the filter is contained in the Instruction Book that accompanies delivery of each 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.

Technical data

	Crosshead X280D	Trunk piston T150D, T280D
Normal filter outlet pressure	2–3 bar (P2 norm)	3.5–6 bar (P2 norm)
Min. filter outlet pressure	1.4 bar	3 bar
Max. filter inlet pressure	12 bar	12 bar
Test pressure	24 bar	24 bar
Max. viscosity in filter at normal operation	130 cSt	75 cSt
Max. temperature in the filter	100°C	100°C
Alarm Δp	0.9 bar	0.8 bar
Backflushing flow	3% of filter inlet flow	3–5% of filter inlet flow
Housing material	Nodular cast iron	Nodular cast iron
Filter screen material	Stainless steel	Stainless steel

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