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Diesel Engine Lube Filtration

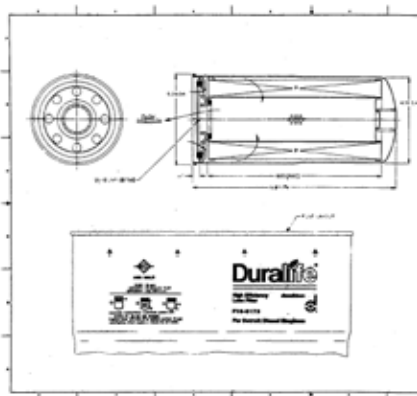
Much of the developed world's infrastructure can be attributed to the application of the diesel engine. The evolution of the diesel engine has been significant since first patented by Rudolph Diesel in 1892. However, the working principle remains a constant. Much the same can be said of the lube or oil system within the modern diesel engine. The lube system functions as the central circulatory system to these powerhouses in order to keep them running at top performance. While the internal demands continue to evolve, the basic principles remain the same.



Today's diesel engines are tasked with running more efficiently, while leaving a smaller impact on the environment.

These demands continue to drive significant changes to engines and the supporting components. Lube filtration engineers continue to introduce technology to keep these lube systems functioning at peak performance while helping improve the environment through longer oil drain intervals and the introduction of green materials.

Donaldson introduced three extended life lube filters in the early 1980s for three popular U.S. engine makes: Detroit Diesel, Cat, and Cummins. Extended service in 1984 was primarily focused on a more robust filter that would last through an extended mileage interval.



Engineering drawing of our first high efficiency, long life lube spin-on

Emission control technologies such as exhaust gas recirculation (EGR), diesel particulate filtration (DPF), and the introduction of closed crankcase ventilation (CCV) have a direct impact on the lube system. Today's oil handles more contamination for extended periods of time. A well designed lube filtration system is engineered up front with overall engine strategy in mind to provide maximum protection for the life of the engine. The benefits of this up front design have resulted in enhanced filtration medias and inclusion of traditionally separate components into a streamlined system.

Understanding end user needs is a commitment Donaldson takes seriously. It is with this in mind that we strive to offer design flexibility to meet field application needs. Longer life media, extended oil drain products, and traditional product offerings are combined to provide a solution for every unique diesel engine application.

Diesel Lube Oil Trends & Changes

Changes in Lube Oil Systems

- Increased EGR rates, soot & acid
- Crankcase ventilation – less oil consumption, thereby less make up oil added and oil has to work harder
- Improved cleanliness for tighter component clearances
- Typical contaminants
- Design strategies (bypass over-pressure valves, cold flow)

Changes in end user oils

- CJ-4 vs. CI-4 Plus
- Increased levels of fuel dilution due to alternate fuels
- New contaminants due to alternate fuels
- Low SAPS oil compatible with emissions aftertreatment systems

Filtration requirements evolving as a result

- Trend towards "green" cartridge filter
- System approach, integration of components such as oil coolers
- Enhanced protection while maintaining service intervals (bypass or secondary filters, extending service intervals & durable medias)



Full-Flow, By-pass or Two-Stage Filtration

The difference between the various lube filter configurations can be confusing. There are three common filtration approaches.

Full Flow Filtration

Full flow filters receive near 100% of the regulated flow in an engine lube system. Full flow filters provide essential engine protection for maximum cold flow performance and filter life. Most lube filters available today are full flow.

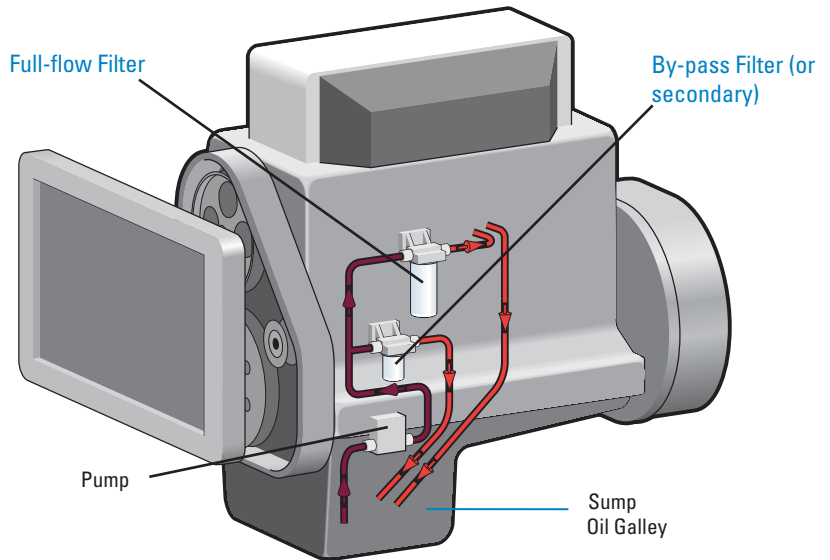
By-pass (Secondary) Filtration

By-pass filtration is when a small portion of the system's oil flow (usually 5-10%) is diverted back to the sump or oil pan before reaching the primary filter. A by-pass filter captures smaller particles than the full-flow filter. Because of the increased efficiency of a bypass filter, they are more restrictive. To optimize restriction, a bypass filter should be located in a separate flow path, as illustrated on the right.

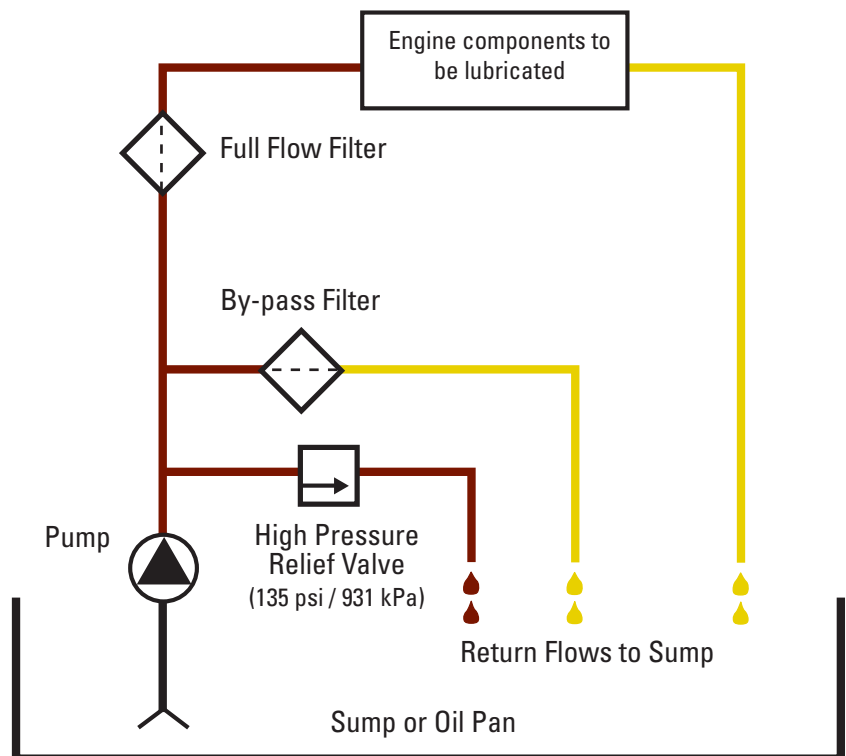
Two-stage Filtration

A two-stage filter design attempts to combine the features of both a full flow and by-pass filter. The two-in-one design significantly increases restriction, causing shorter filter life and decreased cold flow performance. Poor cold flow performance starves the engine of oil during start up, leaving the engine temporarily unprotected. This may lead to increased engine wear that could result in premature repairs or even engine replacement.

Typical Engine Lube Filtration System



Typical Lube Circuit





Filter Media

At Donaldson, we have a variety of lube filter medias available to meet the most stringent of engine lube system design requirements. Donaldson engineers have a history of developing media technology that exceeds application cleanliness and service life expectations. In fact, Donaldson was the first company to introduce fully synthetic media to the engine lube market in the early 1980s. This media is now commonly adopted for extended life or enhanced engine protection needs.

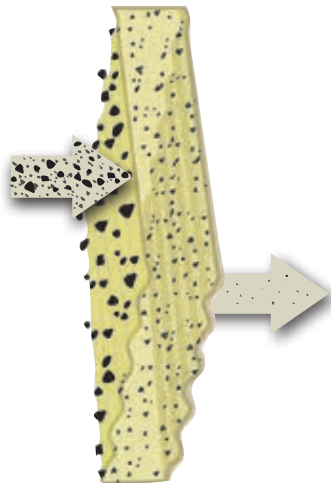
New lube media types are constantly under evaluation in our internal laboratories and in controlled field testing. If you have a specific application requirement, please contact Donaldson to see if there are additional media option to better suit your application.

Cellulose (traditional media)

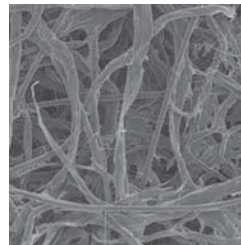
Engine lube filter media is most commonly a pleated cellulose base material. This media effectively combines an application's efficiency and capacity requirements while maintaining cost effectiveness.

As oil flows through media, large contaminants are captured on the surface of the filter while smaller contaminant becomes embedded in the underlying media layer. Industry filtration performance standards (ISO 16889) are used to determine a performance rating. The combination of the size of the particles and number of particles that pass completely through the media are measured as a "beta ratio" function. The filtration performance characteristics of a lube system are typically specified by the engine manufacturer.

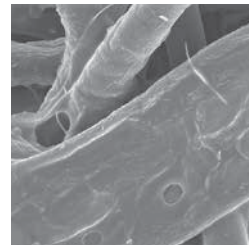
How it Works



SEM 100x



SEM 600x



Media Image

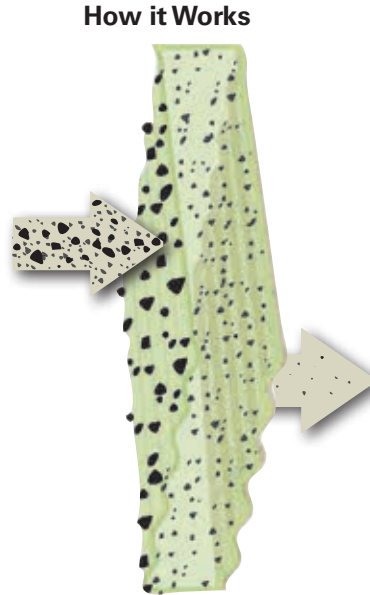




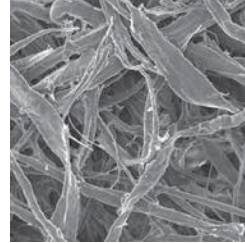
Synthetic Blend (cellulose & synthetic media)

This media is a blend of cellulose and synthetic media technologies. It utilizes the best attributes of both media fiber types to achieve an improved cost to performance ratio for more demanding applications than a cellulose only media can achieve.

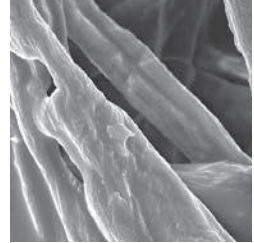
This media provides the consistency of layered fibers to capture coarse contaminant coupled with the affordability of cellulose to deliver an efficient and effective performance alternative to traditional cellulose media.



SEM 100x



SEM 600x



Media Image

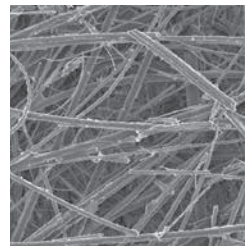


Synteq™ Media (full synthetic media)

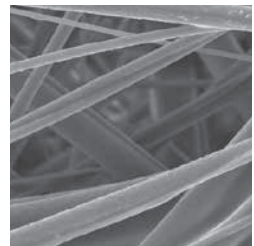
This engine lube filter media is constructed of layered, micro-fiberglass synthetic fibers and is trademarked Synteq™. It provides enhanced durability for extended drain intervals while maintaining or improving efficiency and capacity. Donaldson Synteq lube media also offers lower restriction. Low restriction allows better flow which ensures component protection over a larger range of engine conditions.



SEM 100x



SEM 600x



Media Image





Lube System Profile

At the end of this publication is a “tear-out” profile form for you to use to convey your system needs to Donaldson engineers.

The system profile has a list of all the design considerations required for proper engineering review to determine which Donaldson lube system would be the optimum solution.

- Lube system characteristics - oil flow rate, oil pressure, and temperature
- Filter change interval
- System functions - including pressure regulators, by-pass valve settings and anti-drain back
- Mechanical performance requirements - pressure, fatigue and vibration
- Filtration performance and test conditions
- Fitting and servicing considerations

As with most manufacturers, custom solutions require minimum annual production volumes and design and development phases. See page 143 for our lube filtration system design worksheet.

What's Right For Your Engine?

As you develop the future design of your engine or application, it is important to consider the filtration system needs. Depending on your objectives, it may be beneficial to choose from a catalog offering or partner with Donaldson for a filtration solution tailored to your application.

Reasons to Select a Standard System

- Low budget for engineering collaboration, development time or cost or component tooling
- Prefer to have parts readily available – want to avoid manufacturing lead times (8-12 weeks) and not interested in warehousing service parts
- Have a need mix and match head assemblies with various filter performance choices
- End users would prefer an established brand for filtration

Reasons to Consider a Custom System

- Engine design team is integrating new components that require a higher degree of filtration
- Looking for a system that does more; may include sensors, pumps, and/or heaters
- Have budget for engineering collaboration, development time/cost
- Interest in component / supplier consolidation – solutions that bridge a wide range of engine/vehicles
- Offering a unique solution with ease of maintenance

Common Liquid Filtration Terms

Spin-On: Filter encased in a metal housing for easier service

Cartridge: These fit into a filter housing which is spun on into a filter head

Cellulose Media: Media from wood fibers

Synthetic Media: This media is comprised of man made fibers and typically results in a lower pressure drop than cellulose media.

Housing: The place in which the cartridge filter fits into

Micron (µm): The measurement of minute particles of dirt

Pressure Drop: The pressure difference between the upstream and downstream flow

Pressure Regulating Valve: regulates the pressure depending on the liquid force detected at the end of the receiving piston

Sump or Oil Pan: crankcase or oil reservoir of an internal-combustion engine

Full Flow Lube Filter: filters the oil passing through the engine before it reaches the bearings

Bypass Lube Filter: removes smaller particulates than would be removed by an engine's normal filter, so that the need for additional oil or oil changes can be reduced

Baffle Plate or Thread Plate: mounted in the housing below the bearing will help retain the grease where it is needed



Extended Service Oil and Filters

Donaldson introduced three extended life lube filters in the early 1980s for three popular U.S. engine makes: Detroit Diesel, Cat and Cummins. Extended service in 1983 was primarily focused on a more robust filter that would last through an extended mileage interval.

Today, extended service filters are expected to last to the next oil change - in some cases this is double or triple traditional spin-on lube filters. Another major appeal with extended service filters is the “green” aspect – the use and disposition of fewer filters.

Extended Service Oil Drains

The key to any oil drain extension program is doing it safely to ensure not to create any harmful effects. The proper way to implement the change that is through oil analysis. Oil analysis measures critical oil parameters to ensure that the oil quality and is critical to establishing an extended drain.



Oil Analysis Kit X007374

Oil Considerations & Extended Drain Filters

Today’s mineral based oils are completely adequate for most heavy duty driving conditions and user needs. The formulations have evolved to the point that the serious problems of the past (such as viscosity breakdown) are no longer of concern for most applications. Additionally, the ability to readily combine with today’s additive packages and significantly lower price has helped mineral based oils remain the clear favorite.

Synthetic oils can perform better than mineral oils in extreme temperatures, both hot and cold. At sub-freezing temperatures, flow properties of synthetics are better. This means faster starts, and faster oil delivery through the engine. The benefit is better lubrication on start up and less work for your starting system. Synthetics are usually SAE 5W-40 / ISO VG 22-150 viscosity grade (mineral oils typically being SAE 15W-40/ISO VG 46-150) and allow a little better fuel economy (1-3%). However, driving habits have the most influence on fuel economy.

At high temperatures, synthetics are more oxidation resistant and less volatile than mineral oils. Less volatility can be a benefit, because less oil will be lost by evaporation, and may reduce the to top-off oil as frequently. High temperature oxidation resistance isn’t always a benefit.

Many older diesel engines don’t get hot enough to really challenge mineral oils that contain antioxidants. With more sophisticated emission control systems, engines may run hot enough to favor synthetic oil.

While there are clear benefits to synthetic oil, at least two drawbacks have hindered their wide spread adoption. The first issue is that synthetic oil has poor solubility for additives; making it harder to control for soot and Total Base Number (TBN) retention. All the while the base stock synthetic oil may remain useful, soot levels may exceed OEM guidelines or the oil may become too acidic. Secondly the price for synthetic oils is typically 3 – 4 times the cost of a comparable mineral oil. Combine the cost with the unlikely prospect of tripling an oil drain and synthetic oil becomes cost prohibitive.

Extended Service Filters

Donaldson Blue™ filters are for those who want to maintain oil health over the new drain interval and need a filter that can last as long as the oil.

Our Donaldson Blue lube filters use Synteq™ media. Synteq is more effective than standard cellulose filter media at removing small contaminants, it improves lubricant flow and offers increased dirt holding capacity for the extended service.

Donaldson Blue filters are direct replacements to standard filters – no system modifications and no special disposal requirements.



Donaldson Blue™ Lube Filters Help You Go the Extra Mile Delivering Extended Service Intervals



Donaldson Blue™ lube filters are designed for heavy-duty truck and diesel engine extended maintenance programs. Just a simple cross reference of your current lube filter and you'll reduce oil consumption, increase engine protection and reduce operating costs.

For most lube filters, the secret to balancing efficiency, capacity and restriction is hidden underneath the surface. Donaldson Synteq™ media technology provides the optimal balance of all three characteristics. Donaldson Blue filters are the definitive choice to protect equipment, reduce maintenance cost and increase equipment uptime.



Donaldson Blue™ lube filters with Synteq™ media reduce oil consumption, increase engine protection and reduce operating costs. They provide the optimal balance of efficiency, capacity and restriction, and remove more than **90% of contaminants** that are 10 microns or larger, compared to 50% or less for typical cellulose filters. At the same time, they deliver **nearly double** the contaminant carrying capacity of standard cellulose filters. Fully synthetic Synteq media also delivers **lower restriction** to provide **maximum oil flow**. Donaldson Blue lube filters are designed specifically to provide **longer filter life** – a critical component of any extended filter maintenance program.



Upgrade from a Competitive Filter to Donaldson Blue™

Donaldson Blue filters are direct replacements to standard filters – no system modifications or special disposal requirements.

Donaldson Blue™	Donaldson Standard	Fleetguard	Baldwin	Luber-finer	Wix	Primary Application
DBL3998	P552100	LF9620	B495MPG	LFP2160XL	51971XD	Detroit Diesel Series 60 Engines
DBL7300	P553000	LF9039	BD7309	LFP3000XL	51748XD	Cummins® Engines
DBL7345	P558616	LF3805	—	—	—	Cummins® 4B 3.9 Series Lube
DBL7349	P558615	LF9028	BT7349	LFP780XL	57620XE	Cummins® 4B and 6.B Series Lube
DBL7367	P550367	LF9026	—	LFP2285XL	—	Navistar Engines
DBL7405	P554005	LF9691	B7249MPG	LFP4005XL	51792XD	Caterpillar Engines
DBL7483	P553191 / P550519	LF9667	—	LFP3191XL	—	Mack/Volvo Engines
DBL7670	P551670	LF9325	B96MPG	LFP670XL	51970XD	Cummins® Engines/ Detroit Diesel Engines
DBL7690	P550769	LF16046	—	—	57213	Mercedes Engines
DBL7739	P554004	LF3379	B76MPG	LFP3191	51791XE	Caterpillar Equipment
DBL7900	P559000	LF9031	—	—	57746XD	Cummins® ISK Engines and ISM Engines
DBL7947	P550947	LF3363SC	—	—	—	Detroit Diesel Engines



Extended Oil Drain Intervals

Extended Oil Drain Intervals Oil service intervals are pre-determined by engine manufacturers (OEM's) and are designed to provide maximum engine protection under a wide variety of conditions. While a majority of equipment owners follow these guidelines there is a growing trend to extend oil service intervals beyond the OEM recommendations. However, Extended Oil Drain Intervals (EODI) are not for every application. To fully understand the risks involved you must look at the key factors affecting EODI's.

Engine lubricating oil is often referred to as the life blood of the engine. This analogy is not made simply because the oil circulates through the engine but more importantly because the oil performs critical functions necessary to maintain engine performance and maximize useful service life. There are two basic types of oil available today: mineral and synthetic. While these oils are completely different in composition, they must still meet the American Petroleum Institutes (API) qualification criteria recommended by the engine manufacturers. There are many suppliers of oil in the market today and not all meet the stringent requirements of the API standard. Insuring your oil meets these requirements and understanding the factors affecting the engine oil is the first step before extending your oil service interval.

Equipment operating extremes of heat, cold, idle time, airborne contaminants, and engine load adversely affect engine oil. Excessive Heat will break down engine oil and create deposits in the engine adversely affecting engine life. Severe cold will limit the ability of the engine oil to lubricate at start-up and may add unwanted moisture and unburned fuel to the oil. Extended Idle Time can result in increased amounts of unburned fuel entering the oil resulting in oil dilution and inadequate lubrication. Extreme dust conditions may tax even the best air filtration system adding fine contaminants to the oil overloading the additive package that keeps them in suspension. Heavy loads on the engine can produce extra heat putting a greater demand on the cooling system and increasing the importance of cooling system maintenance during EODI's. Off-road operation will likely see more of these extremes than on-highway operation.

Engine designs today are cleaner burning with reduced emissions and make excellent candidates for extended oil drain intervals. However, most customers cannot afford to buy new equipment every year and normally fleets have a mixture of equipment varying in vintage and service life. As piston rings and valve guides wear in the engine, combustion by-products increase. These combustion by-products end up accelerating oil additive depletion and can create harmful deposits on internal engine surfaces making the engine less likely to benefit from an EODI.

Oil filters remove contaminants from the oil before they generate wear on engine component surfaces. There are many filtration products offered in the industry today with some claiming to allow for extended oil drain intervals. The fact is, the filter alone will not extend the life of engine oil. The filter has one function, and that is to filter contaminants from the oil. While most filters today do an excellent job in filtering, the trend of extending oil drain intervals 2 to 3 times the normal service interval has pushed the materials used in the manufacture of filters to the limit. Adhesives, rubber compounds, filter media, and even the steel construction in spin-on filters needs to be designed to meet the extended period of time they are expected to be in service. Before considering an EODI make sure the filter manufacturer will warranty their product when used in this manner.

If after considering all the factors affecting extended oil drain intervals you feel your equipment is a candidate for EODI's you will need to develop a test program to determine what length EODI is right for your equipment. To determine the correct length EODI you must first implement an oil analysis program to develop history on each piece of equipment scheduled for extended oil service. This will allow you to determine if there is any usable life left in the oil. The primary indicators will be silicon (dirt), viscosity (oil film strength), soot (combustion by-product), and total base number (TBN). Most engine manufacturers have oil analysis guidelines.



Typically you will want to keep your silicon within 15ppm of the initial oil sample, your viscosity within the original oil grade specifications, soot below 3%, and the TBN number above 3. Each piece of equipment will vary and the key is to look for trends in the analysis. If oil analysis indicates you can extend your service interval you then need to move out in steps. Oil analysis should continue at the normal service interval and in increments of 20% thereafter until the analysis shows the useful life of the oil deteriorating. Once the maximum limit on the oil is reached the change interval should be set at the mileage of the previous sampling prior to indications of oil deterioration. Example: Normal service interval = 16,000 miles (25,000 km). Oil analysis performed at 16,000 (25,000 km), 19,200 (30,000 km), 22,400 (35,000 km), 25,600 (40,000 km), and 28,800 (45,000 km). If oil analysis indicates problems at 28,800 (45,000 km) the change interval should be backed off to 25,600 miles (40,000 km). This will allow for variables in operation and environment.

Extended oil drain intervals are not without risk and short term cost savings benefits should be balanced equally with engine performance and reliability. With all of the factors affecting the engine oil it is easy to see why OEM's have traditionally been conservative in setting oil drain intervals. If you think your equipment is a candidate for EODI program, do some research. Check with your filter, engine, and oil manufacturer for guidance. If you're not doing oil analysis, start a program. Review your filtration package and most of all understand the potential risks involved. If not properly implemented EODI short term savings are offset by expensive repairs and downtime further down the road. Always dispose of used engine oil and filters properly.

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Oil Analysis

Donaldson uses independent laboratories for oil analysis services and these labs are typically different from region to region. Each provides fast and accurate information about the status of your equipment. We only select labs and programs have have proven laboratory techniques and covers a wide range of systems and applications. Typical oil analysis service includes evaluating the results of the tests we perform and providing detailed reports, including specific maintenance recommendations.

Vehicle owners use the data and recommendations to improve preventive maintenance, reduce equipment downtime, and reduce overall cost of lubricants by extending oil drain intervals.



Typical Oil Sampling Steps

- Collect the oil sample with sampling device
- Complete a lab processing form
- Labeling the sample with vehicle id, hours, miles, etc.
- Send the sample to lab
- Lab returns results - via mail or on-line.

Recommended Sampling Intervals

On-Road Engines

Diesel	10,000 miles / oil change
Gasoline	3,000 miles / oil change
LPG	3,000 miles / oil change
Non-Engines	20,000 miles / 500 hours

Off-Road Engines

Diesel	250 hours / oil change
Gasoline	150 hours / oil change
LPG	150 hours / oil change
Non-Engines	500 hours / monthly



Oil Analysis Kit for Fleets and Off-Road Vehicles and Equipment

Use X007374 for routine oil analysis for diesel engines or hydraulic oil reports on wear metals and additives.



Kit Part No. X007374

Metals, ppm by wt	◆
Viscosity, cSt.	◆
Water %	◆
Fuel % by Infrared	◆
Soot by Infrared	◆
Glycol (Coolant)	◆

Sampling Accessories

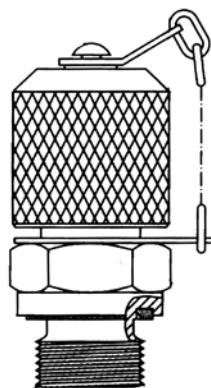
These accessories can simplify your oil analysis during the normal maintenance routines.

Plastic Tubing Part No. P176433

Sampling Pump Part No P176431



Sampling Pump & Plastic Tubing (sold separately in 100 ft. rolls)



Quick Sampling Valve.

Oil Analysis Program Video Available on YouTube®

Donaldson recommends oil analysis as a fast and highly accurate way to assess what's in your engine's oil. An overview video is available on our YouTube channel as a resource for understanding our engine oil analysis program. This video reviews why a preventative maintenance program is important, how the analysis works, and how to read the lab report.

SERVICE TRAINING VIDEOS



youtube.com/user/donaldsonengine

Sample Processing/Reporting

Labs will request that you send your oil sample(s) as soon as possible after collecting. The oil samples do not “break down,” but any long delay between sampling and analysis can be crucial if a unit is failing.

Once the oil sample reaches the lab, we will process it within 24 hours. You will be notified by phone/fax if critical conditions are present.

Features of the Report:

- Up to 6 sets of test results (current and 5 previous) displayed
- Spectrochemical and physical results underlined where applicable
- Full headings for all results



Lube Filtration Systems

The following pages present Donaldson's catalog product offering for Lube Assemblies. Product offering includes both by-pass and full-flow filtration designs.

Use the matrix below to determine the filtration system that best matches up with the flow requirements and the key features for design and mounting on your engine.

Filter Performance Choices

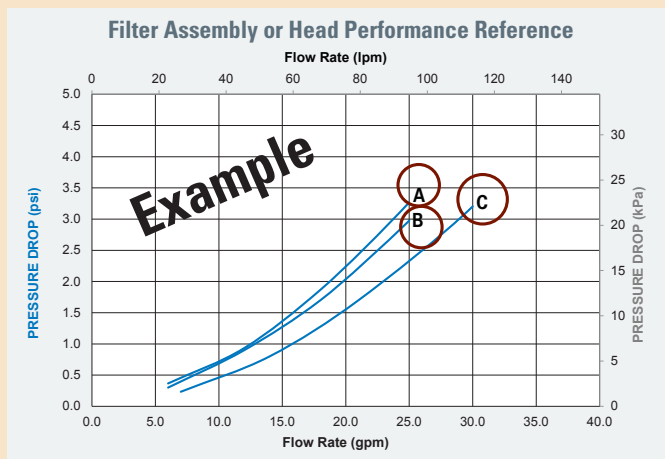
The filter tables provide you with the separate filters that fit the same head assembly – these differ by length and filter performance. Choices are presented by level of efficiency.



Lube Filter Mix & Match Choices

Mix and Match Lube Filter Systems		
Families by Filter Diameter ϕ	Flow Range	Features
93 mm / 3.54"	20 gpm / 76 lpm	Standard design for full flow filtration, top mount, single port head, spin-on filter
118 mm / 4.65"	1.75 gpm / 6.62 lpm @ 85 psi	Standard design for bypass filtration, side mount, single port heads, spin-on filter
	45 gpm / 170 lpm	Standard design for full flow filtration, top mount, single port head, spin-on filter

How Donaldson Displays Filter Flow versus Pressure Loss Data



Performance Curve Notes

- Pressure loss was tested per the ISO 3968 standards.
- All flow measurements were made with Mobil DTE Light oil at 144°F (62.2°C), 15 cSt.
- Test conducted with a sample size of three filters.
- Filter performance curves will list an alpha reference (see circled areas on chart). These labels correspond with the filter choice tables.



By-Pass Lube Filtration

Filter Dia. 118 MM (4.65") X 1 3/8"-16



Flow Range: up to 1.75 gpm / 6.62 lpm

Operating Pressure

Up to 150 psi (1034 kPa)

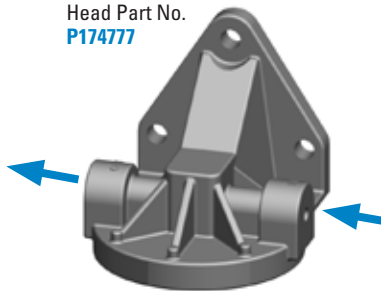
Flow Rate

1.75 gpm / 6.62 lpm @ 85 PSI

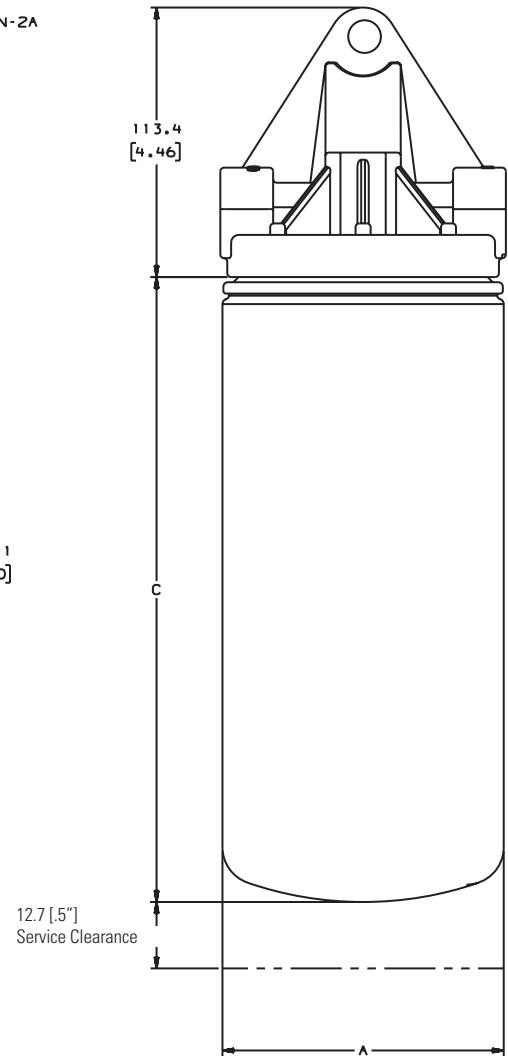
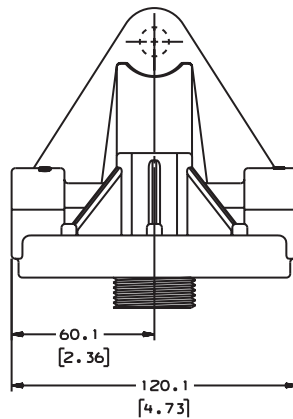
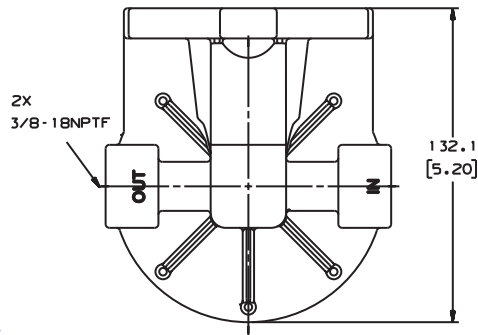
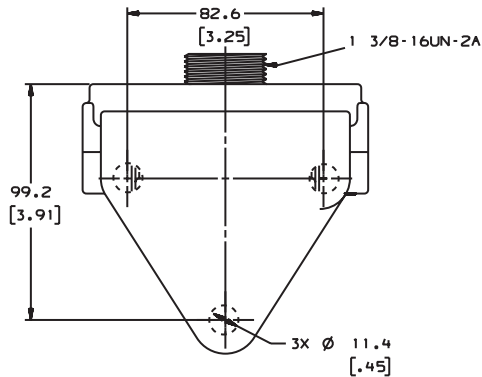
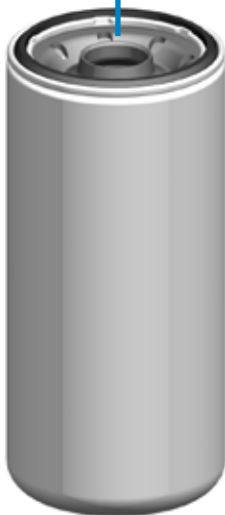
Oil Compatibility

Compatible with petroleum based fluids (hydrocarbon) and up to 20% biodiesel

Head Part No.
P174777



Threaded stud not viewable, due to angle of view

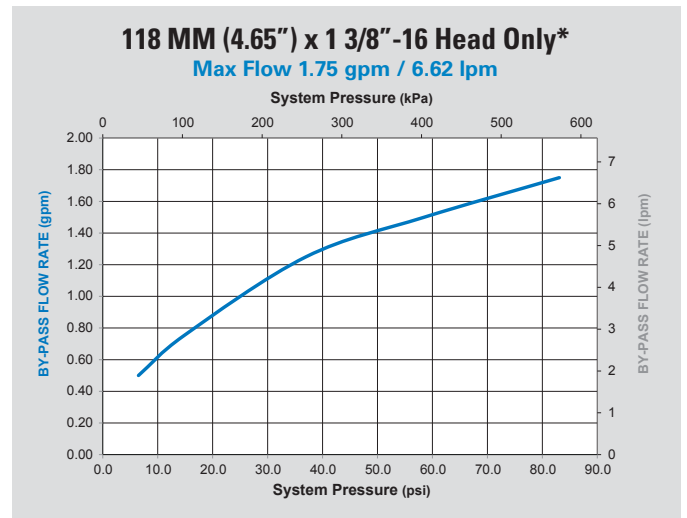
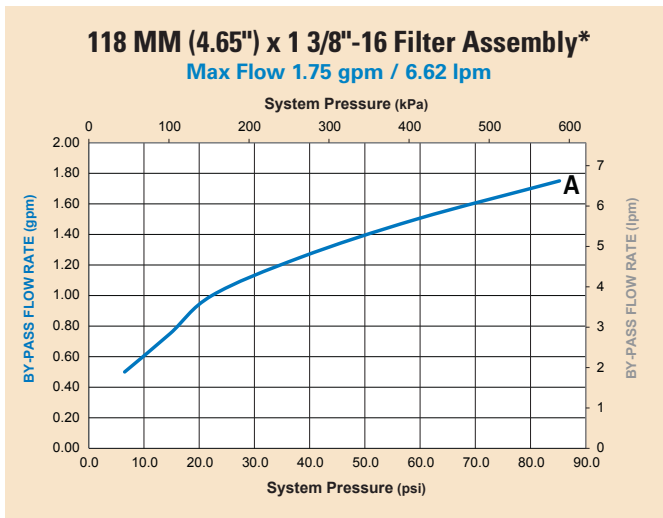




Filter Selection Chart

Outer Diameter		(C) Filter Length		Media Type	Efficiency @ Micron	Part Number	Performance Curve	Gasket Outer Diameter		Gasket Inner Diameter	
in	mm	in	mm					in	mm	in	mm
4.65	118	8.94	227	Cellulose	99% @ 23	P550777	A	4.32	110	3.85	98

Performance Curves



*These performance curves represent clean filter by-pass flow as a function of system pressure.



Full-Flow Lube Filtration

Filter Dia. 93 MM (3.66") X 1"-12



Flow Range: up to 20 gpm / 76 lpm

Operating Pressure

Up to 150 psi (1034 kPa)

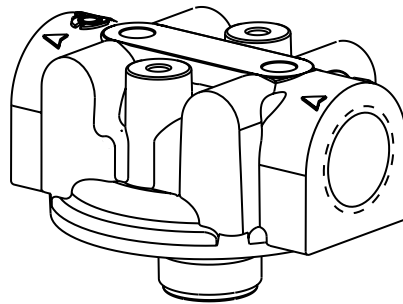
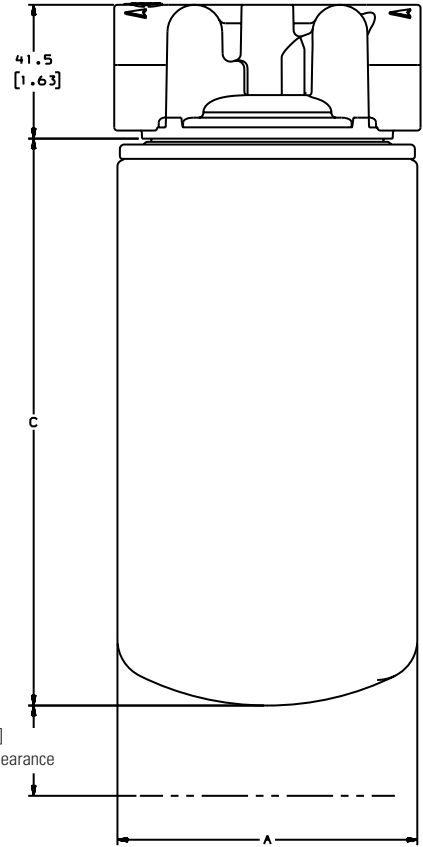
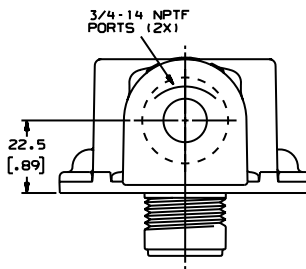
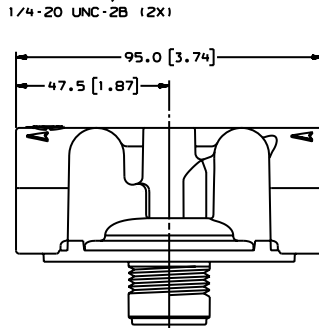
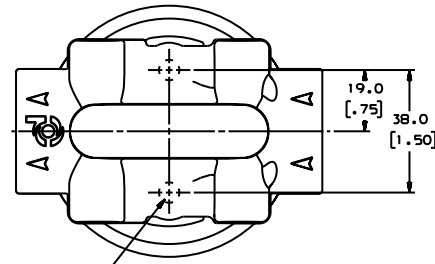
Flow Rate

Up to 20 gpm / 76 lpm

Oil Compatibility

Compatible with petroleum based fluids (hydrocarbon) and up to 20% biodiesel

Head Part No.
P561134

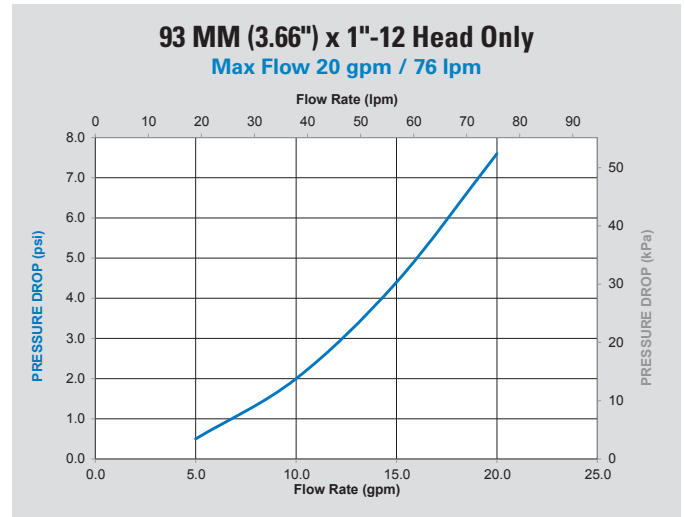
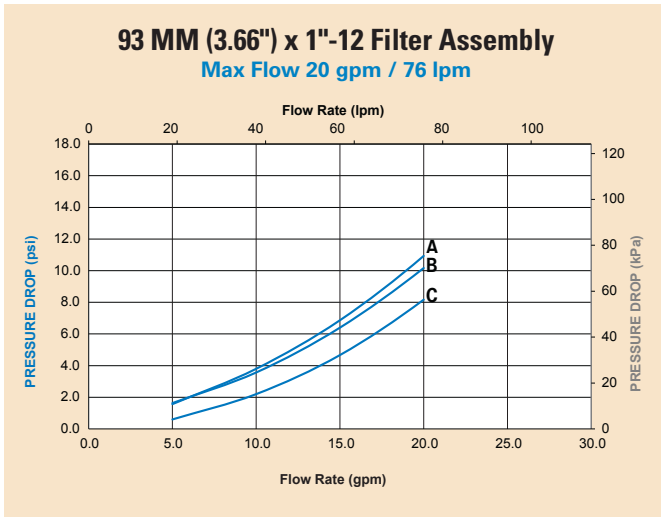




Filter Selection Chart

Outer Diameter		(C) Filter Length		Media Type	Efficiency @ Micron	Part Number	Performance Curve	Anti-Drain Back Valve	Filter Relief Valve Setting		Stand Tube	Gasket Outer Diameter		Gasket Inner Diameter					
in	mm	in	mm						PSI	Bar		in	mm	in	mm				
3.66	93	5.35	136	Cellulose	99% @ 40	P552819	B	Yes	18-23	1.30-1.60	No	2.83	72	2.42	61				
				Cellulose		P555680	C		18-23	1.30-1.60	No								
		6.85	174	Cellulose		P553712	C			No									
				Cellulose		P555616	A	Yes			Yes								
				Cellulose		P557207	C		7-10	0.50-0.70	No								
7.87	200	Cellulose	P553771	A		Yes	35	2.41	No										
3.74	95	5.35	136	Cellulose		P559418	B	Yes	36	2.48	No								
3.81	97	6.85	174	Cellulose		P558250	B	Yes	11-17	0.80-1.00	No								

Performance Curves





Full-Flow Lube Filtration

Filter Dia. 118 MM (4.65") X 1 1/2"-12



Flow Range: up to 45 gpm / 170 lpm

Operating Pressure

Up to 150 psi (1034 kPa)

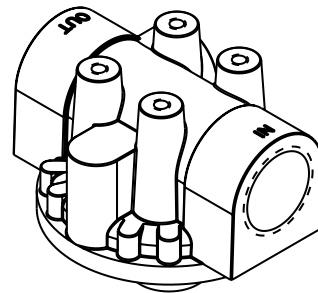
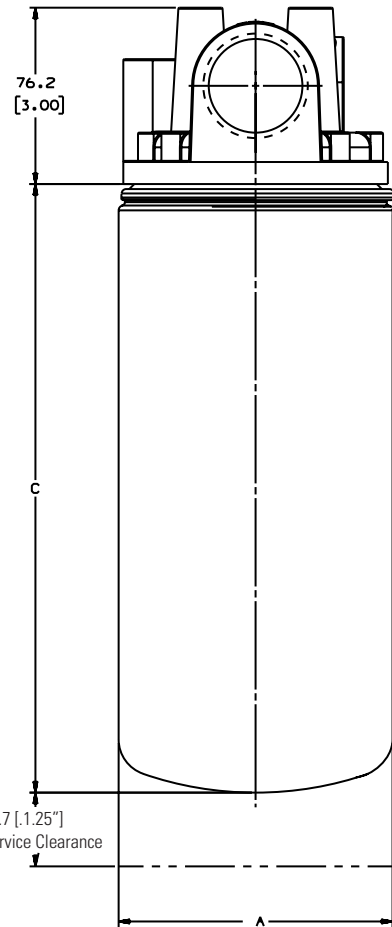
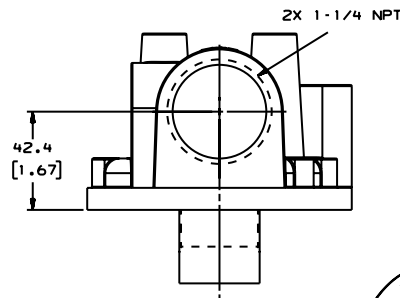
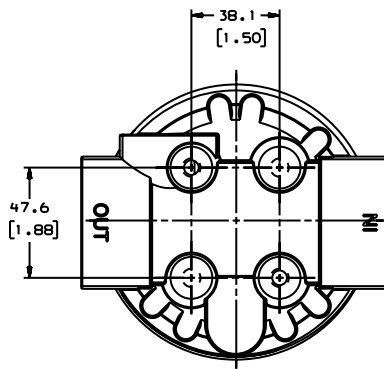
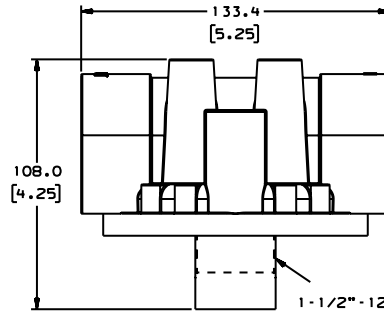
Flow Rate

Up to 45 gpm / 170 lpm

Oil Compatibility

Compatible with petroleum based fluids (hydrocarbon) and up to 20% biodiesel

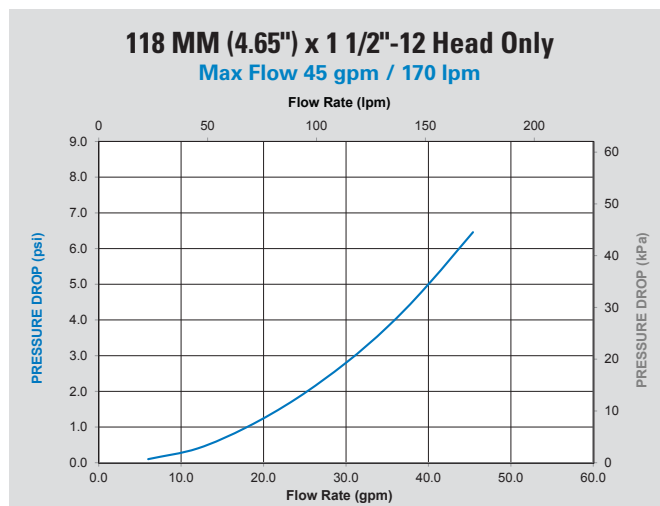
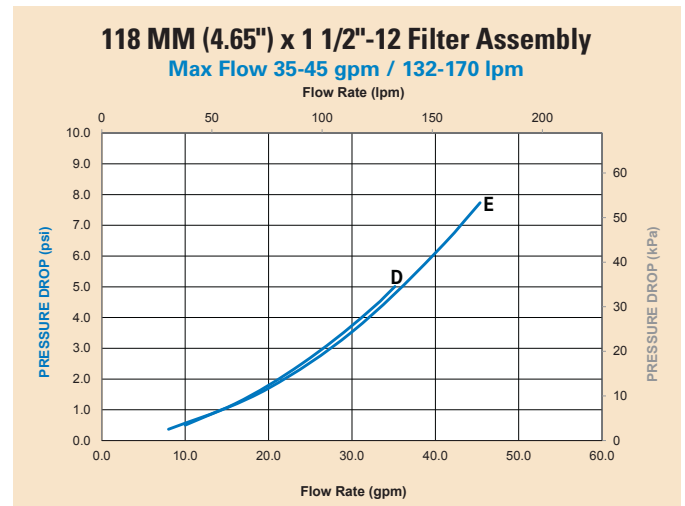
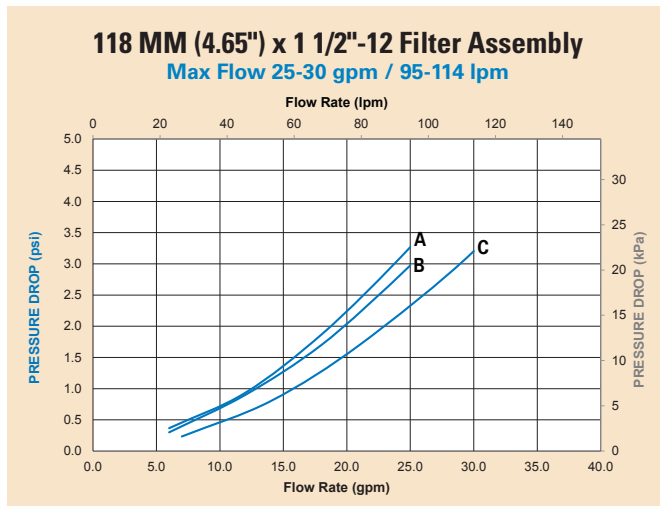
Head Part No.
P174780



Filter Selection Chart

Max. Recommended Flow Rate		Outer Diameter		(C) Filter Length		Media Type	Efficiency @ Micron	Part Number	Performance Curve	Gasket Outer Diameter		Gasket Inner Diameter	
gph	lph	in	mm	in	mm					in	mm	in	mm
25	95	4.65	118	6.22	158	Cellulose	99% @ 23	P550947	A	4.32	110	3.85	98
						Synteq	99% @ 16	DBL7947	B	4.31	109	3.84	98
30	114			7.83	199	Cellulose	99% @ 40	P551381	C	4.32	110	3.85	98
35	132			8.94	227	Cellulose	99% @ 23	P550671	D	4.32	110	3.85	98
45	170			10.24	260	Synteq	99% @ 16	DBL7670	E	4.31	109	3.84	98
				Cellulose	99% @ 23	P551670	E	4.32	110	3.85	98		

Performance Curves





Lube Filtration

Lube Filters for Cummins® ISX Engines



Full-Flow Lube Filters for Cummins® ISX Engines

Every oil filter needs to effectively balance three characteristics: efficiency (contaminant removal), capacity (contamination holding ability) and restriction (resistance to oil flow). Donaldson full-flow lube filters process the entire regulated oil flow through our pleated elements, even in cold temperatures – meaning your engine receives critical lubrication protection. Two-stage stacked disc filters allow only a portion of the flow to pass through the high-efficiency stage – which means more contaminant can pass on to the engine.

That's precisely why Donaldson recommends full-flow lube filters that strike the right balance for Cummins ISX and other heavy-duty engines. Donaldson filters deliver:

- Ultra-high efficiency on fine particulate and oil degradation (sludge),
- Higher contaminant holding capacity, and
- Minimum oil flow restriction.

Donaldson offers three different lube filters for ISX engines that keep oil cleaner by capturing more contaminants that can cause engine wear. Choose the filter that best fits your requirements.

OEM Efficiency

High Efficiency

STANDARD SEALS

HEAVY-DUTY SEALS



P550949

OEM Efficiency

Reliable contaminant capture and capacity (life). If you've experienced filter plugging due to excessive sludge caused by soot or coolant contamination – this is the filter for you.

- Efficiency: >99% @ 30µm
- 35% lower oil flow restriction than LF9080

CROSSESTO:

Cummins 2882674 / Fleetguard LF9080

Tested per ISO 4548/12 and ISO 3968.



P559000

High Efficiency

Increased levels of contamination capture combined with good capacity. Offers a higher level of engine protection than the OEM standard option.

- Efficiency: 99% @ 15µm
- 13% lower oil flow restriction than LF9080



DBL7900

(ELF7900)

High Efficiency with Heavy-Duty, Long-Life Seals

If your primary concern is engine protection – this premium filter will deliver with durable seals and heavy-duty potting materials to withstand extreme conditions and hot oil temperatures.

- Efficiency: 99% @ 15µm
- 40% lower oil flow restriction than LF9031

Cummins 4906633 / Fleetguard LF9031

Cummins® is a registered trademark of Cummins, Inc.

See brochure F113026 for further performance information.

www.donaldson.com/en/engine/support/datalibrary/084768.pdf