

The by pass filter system passes only a small portion of the total oil flow through a very dense filter cartridge at around 6 to 7 litres per minute. At this speed, it is possible to remove particles down to 1 micron and totally remove water, greatly decreasing engine wear and prolonging oil life. This type of filtration can eliminate water and particle contamination, extend oil life up to 5 times and hydraulic oil up to 10 times, reduce engine wear and component wear, dramatically reduce downtime, remove particles down to 1 micron, and is applicable to all engines as well as for hydraulic systems.

Bypass oil filtration technology was originally introduced to the trucking industry in the 1930's. It was the exclusive means for filtering engine oil from the early 1930's until the early 1960's. At that time, engine manufactures moved away from bypass filtration when full flow filtration became the vogue. Full flow filters don't have the ability to filter out anything but the largest particles out of the oil. Factory full flow oil filters are not even designed to purify the oil down to a single digit micron level but mainly to filter all the oil at a high rate before it gets to the engine. Since full flow filters filter the oil at such a high flow rate, it is unable to trap the microscopic particles that enter the oil and which can damage your engine. During the last 10 years bypass filtration interest has been rekindled and has been positioned mainly as a way for fleets to extend engine oil life and oil drain intervals. People now realize you can have the best of both worlds by running bypass filtration along side your full flow filter. This allows the full flow filter to catch the large particles and the Bypass Filtration System to catch particles down to 1- micron in size, all the water and acid, as well as the soot that will inevitably end up in the engine oil.

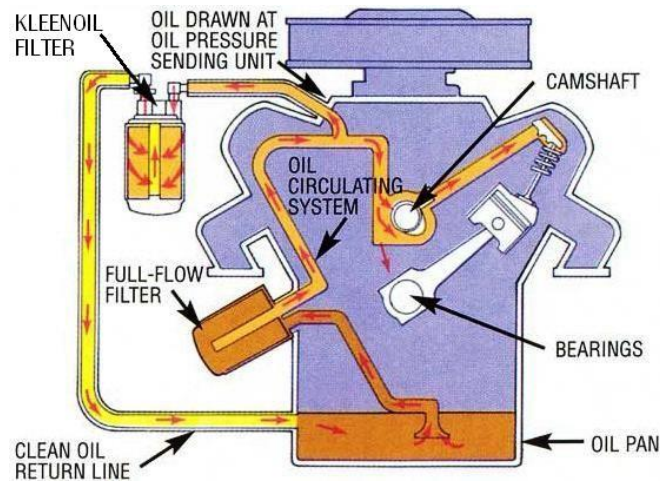
#### Key Benefits to Vehicle Fleets

- Extend oil service life! Typical average oil change cost on a large vehicle is around £80.00 to £120.00 per oil change!
- Reduce operational costs.
- Extend depreciation costs.
- Reducing oil disposal fees.
- Reducing dependency on foreign oil and oil reserves.
- Enhancing our environmental commitment and awareness.
- Assists with reducing the carbon footprint
- Improving daily vehicle availability through scheduled maintenance.
- Reducing unscheduled service breakdowns and costly repairs!
- Freeing up technicians to perform other important service tasks!
- Virtually eliminate engine wear so improving reliability.
- At the end of vehicle service life the unit can be transferred to a new vehicle.
- No moving parts to wear out.
- Remove 99.95% of all water from your oil.
- Assists in cleaner running which can reduce fuel costs.
- Remove's all wear causing particles down to 1-micron in size.
- Reduce time needed for service...those 1-2 hour oil changes become 15 minute filter changes!
- Does **NOT** remove additive package components in oil.



Bypass Filtration Systems can help prevent a build up of contaminants that can score bearings, rings and cylinder walls of the expensive engines in your fleet. Contamination also can contribute to an increase in viscosity and gum deposits on rings and valves. Because filtration is necessary for effective engine protection, it is important to make sure you have the best available system in good working order. According to Fleet Equipment Magazine, 60 percent of the potential causes of wear and failure can be eliminated by well-designed and properly applied filtration systems.

The filter system is especially beneficial on the newer EGR (exhaust gas recirculation) diesel engines as these run hotter and produce more soot and acids than previous models of diesel engines. The very nature of how these newer EGR engines function makes bypass filtration a must have on these newer trucks! Most engine builders have decided that cooled EGR is the most effective way to reduce combustion temperatures. Small amounts of exhaust gas will be piped to the chambers to displace oxygen; less oxygen means cooler combustion. Before going to the cylinders, some of the exhaust gas heat will be absorbed by the engine's coolant, thus the term "cooled EGR." New rules now require diesel engines to produce about 50% less nitrous oxide, or NOx, than current diesels thus the reason for the newer EGR diesel motors. More heat, soot and acid will form during combustion in most of these new EGR diesels, say engineers. With greater amounts of soot and acid making its way into the engine oil, the bypass filter is no longer considered an optional item. It is a must have if you want to reduce operational costs and maximize the life of these expensive engines!



### Recommendations for Use

Kleenoil Bypass Filtration can be a valuable addition for a vehicle fleet if:

- You put a large amount of miles on your vehicles annually.
- You currently change your oil every 10,000 to 25,000 miles and would be interested in saving yourself significant money by extending your oil drain interval schedule. Up to a 90% savings can be realized in some cases.
- You want to minimize downtime and maximize your profits.
- You simply want the ultimate in protection for your vehicles and want to maximize the life of the engine.

### Installation and Maintenance Schedule for Trucking Fleets with Kleenoil Systems

Take an initial oil analysis on your existing oil in your vehicles when your normal oil change interval is up **PRIOR** to installing the Kleenoil System. This will give you a baseline reading and evaluate the condition of the engine so you have something to compare against once you have your Kleenoil Bypass Filtration System installed. Installation of the Kleenoil Bypass Filtration System on large trucks is typically on the frame of the engine compartment OR on the frame behind or slightly in front of the fuel tank on the frame on the passenger side of the truck. Install the Kleenoil unit on the vehicle along with a fresh oil change and full flow filter change, change the Kleenoil bypass filter every 15,000 miles and top up with oil. Take periodic oil analysis readings to get an accurate gauge on the oils current conditions and let it be the barometer on when to finally change the oil and full flow filter. The oil will likely come back good for at least 75,000 to 100,000 miles. Most people see 100,000 miles or more on the same oil. Let the oil analysis be your gauge on when to change the oil. If your TAN/TBN numbers still look good and the viscosity and particle levels are staying within spec, you can indefinitely keep the same oil in your vehicle.



### ENGINE & DIESEL FILTER UNITS

#### **Code 9758 Engine Micro Filter Unit.**

Applied to small commercials, generators, forklifts, 4WD's with very tight space.

For Engines with Sump Capacity of 3 gal / 16 litres. This unit is manufactured from solid aluminium rod and is lathe turned and machined. It is ideal for machinery and vehicles that have limited space for installation.



Fitted to VW GOLF TDI



#### **Code 9768 Engine Light Duty Filter Unit.**

Applied to small commercials, small boats, generators, forklifts, 4 x 4WD's For Engines with Sump Capacity of 3 gal / 16 litres. Manufactured from cast aluminium.



Fitted to Toyota HiLux Double Cab 2.4 Turbo Diesel

#### **Code 9778 Engine Heavy Duty Filter Unit**

Applied to general commercials, marine and heavy industry Engines with Sump Capacity of 9 gal / 40 litres or low pressure hydraulic systems with tanks up to 120 gal/ 540 litres. Manufactured from cast aluminium.



Fitted to Caterpillar Engine

### Code KU65 Medium Heavy Duty Filter Unit

Applied to large commercials, marine and heavy industry Engines with sump capacity of 14 gal/63 litres and hydraulic system capacity of 180 gallon/810 litres. Manufactured from cast aluminium.



Fitted to Refrigerator Engine on Articulated trailer

### Code 9788 Super Duty Filter Unit

Applied to large plant & industrial use For Engines with Sump Capacity of 18 gal/80 litres or low pressure hydraulic systems with tanks up to 300 gallons/ 1360 litres. Manufactured from cast aluminium



Fitted to Liebherr Crane Engine

### Sump and Tank capacities are for a guide only.

All filtration units are supplied as a boxed kit containing: Filter housing, filter cartridge, lid seal, mounting bracket, inlet and outlet adaptors and nuts, bolts & washers. All Engine Units can be used on diesel fuel oil & LOW pressure hydraulic circuits (below 110psi).

We recommend that hose assemblies for engine installations are made from PTFE Stainless Steel over braided hose. Flow and return in -4 (1/4") bore. This hose has a smooth internal bore, allows heat to dissipate, and is resistant to cracking and to internal build up from carbon.



### INSTALLATION OF 9768 & 9778 ENGINE FILTER UNITS

#### Step 1: Locating the pressure port and drain port.

It is important that any installation be done at the same time as an oil analysis of the existing oil and a full oil change with the replacement of all the oil filters. To obtain maximum benefits, please ensure that the engine oil and oil filters meet or exceed the manufacturer's recommendations. This system can only be installed on engines with pressurized lubricating oil systems. Pressure ports are generally found near the main oil filter, pressure-sending unit, or along the oil gallery path on the block. There may be pipe plugs installed in unused ports. You may also find capped T's that will also serve as a pressure port. Locate as many ports as possible to give you the ability to route the pressure hose in the least obstructive path possible.



Locate as many drain or return ports as possible. Return ports are generally on the engine block and can be found near the dipstick or in the engine sump pan. Some engines require a hole to be drilled and tapped in the gear cover plates or the valve cover. Please consult your distributor if you cannot locate drain ports prior to drilling and tapping components. Most pressure and drain ports will be 1/8 or 1/4 pipe threads.

#### Step 2: Determine where to mount the canister.

All filter housings come complete with all hardware and mounting brackets. Carefully select where you will mount the unit so that the changing of the cartridge can be done easily. Make sure that the unit is mounted in the upright position with enough room left for the removal of the nuts, lid, and the replacement cartridge. If possible, the unit should be mounted slightly higher than the highest oil level in the engine so that the engine oil will not be siphoned out when the lid is removed. Proper mounting will also allow the engine oil to drain back during shutdown, allowing a clean and easy cartridge replacement.

#### Step 3: Mount the canister bracket.

Place the mounting bracket in the desired location and mark the centre of the two elongated holes with a scribe or a marker. Next, drill the holes using a 25/64 drill bit, taking care not to pierce any electrical wires, hoses or components that may be behind the drilled surface. Attach the two bolts, nuts, and star washers and tighten to 70ft/lbs. or 95Nm.



If you cannot accomplish a drill through hole where access will be available for the nuts, you will have to drill and tap the holes using any appropriate bolts you may have. When tightening the tapped bolts, do not over torque. Refer to the chart below when using different bolts for the bracket mount.

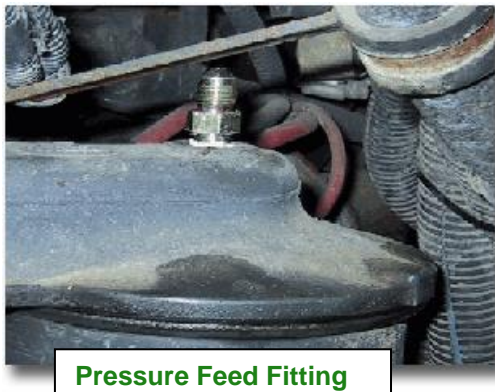
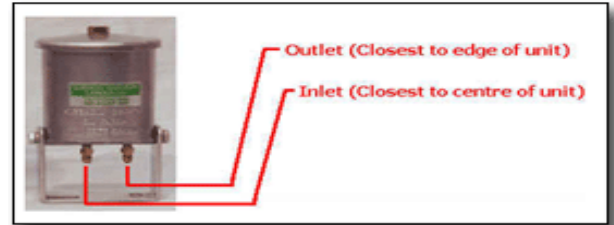
Bolt Size	Torque Grade: 5ft.lbs/Nm	Torque Grade: 8ft.lbs/Nm
3/8"	25-28/ (34-38)	35-40/ (47-54)
1/2"	65-70/ (88-95)	90-100/ (122-136)
5/2"	125-148/ (170-190)	175-190/ (240-260)

### Step 4: Mounting the canister.

There are two fittings under the canister. The one closest to the edge is the return. Consider hose routing when deciding in which direction to mount the canister. Ensure that the bonnet or engine cover will close properly before completing the mounting of the canister. Mount the canister to the already installed bracket and install the two side bolts with the lock washers and tighten each to 70ft/lbs or 95Nm.

### Step 5: Install engine fittings.

First, apply teflon tape or thread sealant to the pipe thread end of the fittings to be installed for the engine pressure and drain. Then, tighten the fittings to 25ft/lbs or 34Nm. The optimal location of the canister and the fittings will differ on every application. Ideally, you should have the shortest possible hose distance. You will also want to make sure that the hoses are away from high heat sources that could damage the outer jacket of the hose. Once fittings are installed, proceed to manufacture suitable hoses.



### Step 6: Hose assemblies.

You want to ensure that the hoses will be of proper length. Excess hose can cause the hose to kink or may vibrate and rub against other components during operation. Hoses that are too short place stress on the fittings and will lead to premature failure. It is preferable to use stainless steel over-braid PTFE hose, but a good quality heat resistant hydraulic hose may also be used. Hose internal diameter is -4 (1/4" bore) for feed and return.

### Step 7: Installing the hoses.

Route and tighten both the pressure and drain hoses ensuring that they are tied with tie wraps to secure the hoses and to prevent the hoses from vibrating and causing premature wear. The pressure hose is attached to the fitting closest to the centre of the unit and the drain is attached to the fitting closest to the edge of the unit. Make sure all the fittings are tight and that the hoses are securely tied away from the heat sources and from abrasion sources. Failure to route and tie hoses properly can lead to premature failure of the hoses that may result in engine damage or personal injury.

### Step 8: Checking the unit operation.

Start the engine and check for leaks around all fittings and the unit lid. After one minute of running, shut the engine off and check the oil level. The oil level will have dropped slightly due to the oil filling the filter unit. Top up the engine with the correct, approved type of oil. Restart the engine and run at approximately 1200rpm. Once the engine has warmed up, the inlet and drain hoses should become warm also. This will ensure that there is flow through the cartridge inside the unit.

The amount of time required to heat up the oil will vary, based on the amount of oil in the engine, the ambient temperature, and the temperature of the oil at the start of the test. The unit has now been properly installed and checked. Should any problems or questions arise, do not hesitate to contact your distributor or our head office.