

KLEENOIL[®]

Microfiltration



**Experience, innovation,
reliability - guaranteed**

KLEENOIL® Lifetime Warranty



KLEENOIL® Lifetime Warranty means:

Unlimited possibility to return a damaged KLEENOIL® by-pass filter. KLEENOIL® Lifetime Warranty is valid for the direct purchaser only and non-transferable.

A further condition is that the filter unit has been installed correctly and exclusively original KLEENOIL® filter elements have been used.

This seal indicates all products in this brochure covered by this Lifetime Warranty.

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The original since 1986



The History

The necessity to additionally filter oil in the by-pass has been developed in the Second World War. The Allies used this technology. For strategic reasons the oil change intervals in military vehicles had to be extended. Only after the oil shock in the middle of the 1970s there was a second wake-up call for this technology.

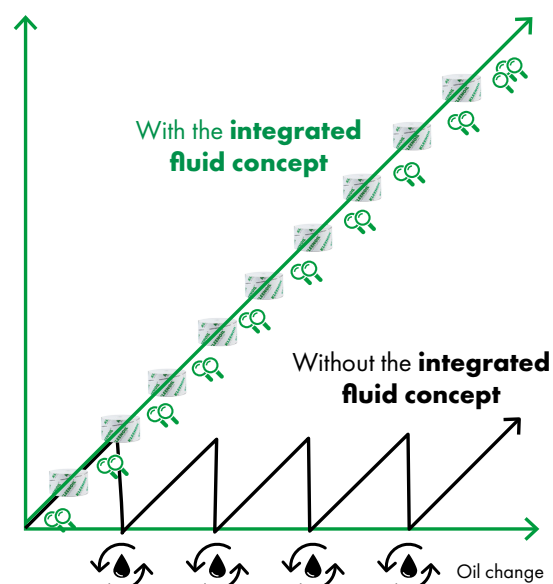


The Beginning

In the year 1986 Milorad Krstić founded the company KLEENOIL Deutschland. The aim was the development, manufacturing and distribution of by-pass microfiltration. For this purpose in the course of time the trade marks KLEENOIL® and CC Microfiltration have been registered. The idea was to only change the KLEENOIL® filter element and make oil analyses instead of observing oil change intervals. Oil changes then would no longer be determined empirically, but depending on condition. The initial target audience were the operators of heavy trucks and buses. "100.000 km without oil change" was the advertising promise. In the year 2009 the oil analysis sensor KLEENOIL ICC® has been developed.

The Concept

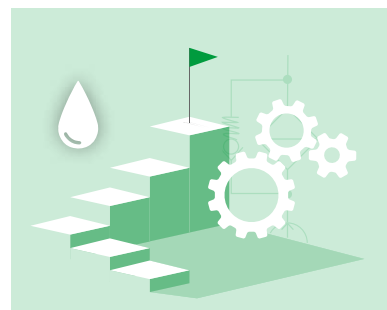
The idea behind the concept was to, in the ideal case, extend the oil change intervals by 10 times. The oil condition is monitored by laboratory analyses. For hydraulic oils in mobile machines the target was 10.000 operating hours. The initial targets have been clearly exceeded in the course of time. Based on this experience the application concepts have been further developed. With the integrated oil analysis sensor KLEENOIL ICC® (option) the oil condition is monitored in real-time. The new target is called lifetime-fill. Apart from solid particles, partially, also varnish is eliminated and water absorbed. By eliminating the contamination with catalytic and abrasive effect, the ageing of the oil is decelerated significantly.



The original since 1986

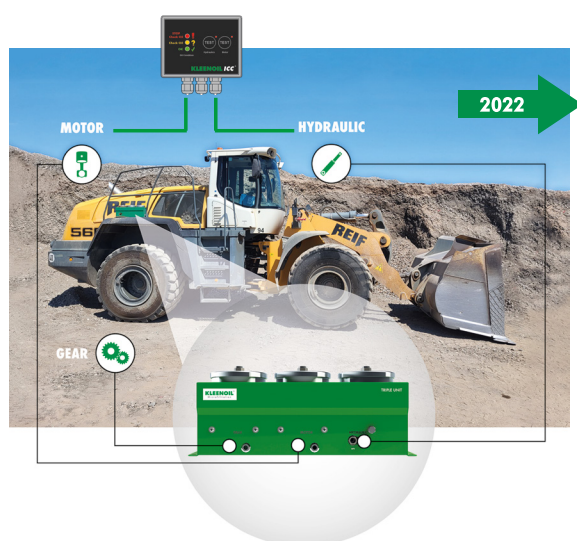
The Success

The promises sounded revolutionary: drastically extend oil change intervals and at the same time reduce wear. But they have been confirmed thousands of times. A lot of machine manufacturers install KLEENOIL® by-pass filters on customer request. In some machine types the KLEENOIL® by-pass filter is already installed serially. Most of the users of KLEENOIL® by-pass filtration use hydraulic oils in their machines as lifetime-fill. Using KLEENOIL® by-pass filters helps to considerably extend oil change intervals. In own test trucks it has been practically proven, that one million kilometres are possible without oil change.



The Original

Like all successful brand products KLEENOIL® filters are copied by brand pirates and offered as counterfeits, too. In such cases very often logo, spelling, packing and the like are modified in order to subvert trade mark laws. Apart from the fact that this infringes trade mark laws, the quality of such counterfeits never corresponds to the quality standards of the original KLEENOIL® products. The difference in price is small compared to the risk of not achieving the expected results or the risk of machine damages.



The Future

While manhood in recent years has grown from approximately 2 billion to almost 8 billion, our earth, as a natural matter is still the same. Now we are facing dwindling resources and the dramatic consequences of environmental pollution. The human race is forced to rethink its future in all areas of life. After more than 35 years of positive experience with KLEENOIL® Microfiltration in the practical application the next target is - a machine without oil change. KLEENOIL® Microfiltration will become more important in the future. Again, this technology is of strategic importance. This time, however, there are no strategic reasons for military vehicles. The focus is on conserving resources and protecting the environment, at the same time reducing operating costs by minimising wear, system failures and premature component breakdowns. In brief: a better and cleaner future.

General information about KLEENOIL® Microfiltration

General advantages

- Mechanical wear is clearly reduced
- Longer useful life of the components
- Ageing of the oil caused by oxidative or catalytic reactions is strongly decelerated
- Premature breakdowns of machines are reduced to a minimum
- Higher reliability of the machines
- Oil change intervals can be extended considerably
- Protection of resources and reduced environmental impact

By using KLEENOIL® Microfiltration a major part of the harmful contamination, even microparticles down to 1 micron and water are eliminated in the by-pass. This way oils can maintain their very good cleanliness for a long time. Thereby ideal functionality as well as excellent wear protection are achieved.

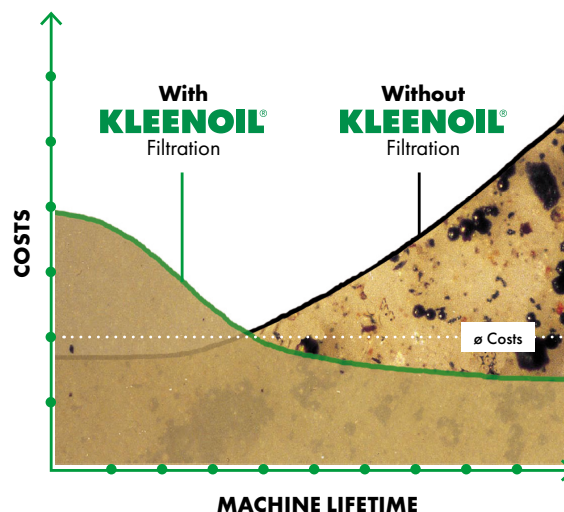
System failures, wear and breakdowns are reduced by decreasing the contamination in the oil. The ageing process of the fluid is decelerated because most of the harmful solid contaminants with catalytic effect as well as water are eliminated. This allows to clearly extend oil change intervals, reduce costs and protect the environment.

The most important advantages are the extension of the useful life of the components, as well as the reduction of the risk of breakdowns and thus a higher level of machine availability.



Application areas

It is wrong to believe that lubricants are clean, as well as it is wrong to assume that with a simple oil change the contamination can be eliminated from the system. A large part of the contamination can be found in the system. With the oil, contaminants - usually consisting of water or various particles - flow through the entire system. In the hydraulic pump these particles are pulverised and it is difficult to eliminate them just with the system filter. This results in an increased wear on all surfaces that are only protected by an oil film.



With KLEENOIL® Microfiltration all hydraulic, gear, engine and other non-water based machine oils as well as diesel fuels can successfully be filtered.

The operating costs of a machine stand in direct relation to the contamination of the used lubricants and pressure fluids. Even taking into account the additional cost of installing KLEENOIL® Microfiltration, the operating costs will be reduced and an overall cost saving will be achieved. By eliminating the contaminants with abrasive and catalytic effect, system failures, wear and downtimes are minimized and as a result the operating costs are reduced.

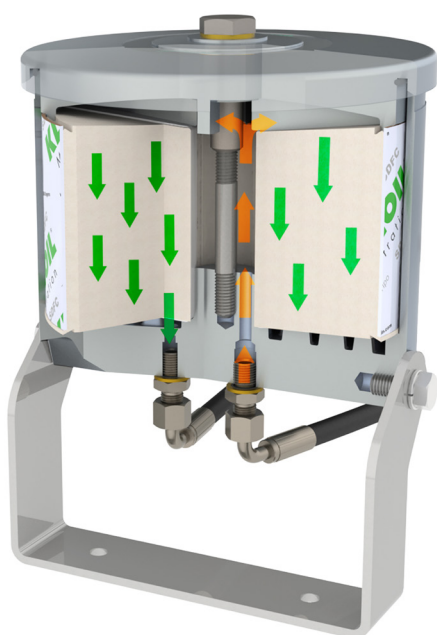
Functional explanation of the microfiltration

KLEENOIL® filter

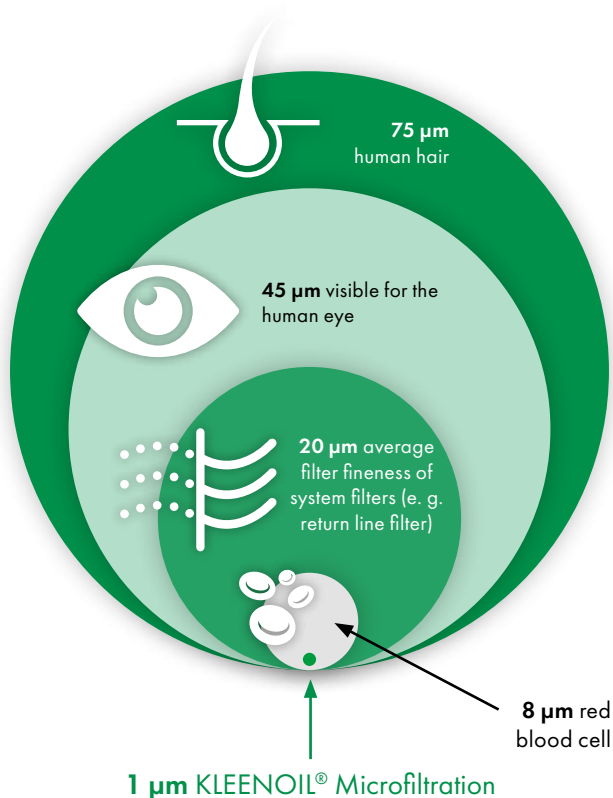
KLEENOIL® filter elements are made of long fibre cellulose, polypropylene and polyester. Its functioning is based on depth sedimentation. The oil is conducted axially through the filter element with low pressure and a reduced flow. Compared to the size of the filter, the dirt and water absorption capacity is higher than average. The additive content in the oil is not influenced.

The filtered oil is kept within its application specifications for a very long time. Micro-contaminants down to a size of 1 micron and condensate are efficiently separated from the fluid. This is ensured by the special construction of the filter housing and the way the oil is lead through the filter element. Even oil decomposition products and varnish can be eliminated by permanent application.

Under extreme conditions, for example if a high quantity of water contamination is brought to the filter element abruptly and/or after re-commissioning with filter elements which in parts are already loaded with contamination, this can cause a filter collapse (deformation). In this case the filter elements have to be changed and, depending on the application, the change intervals have to be reduced.



Size comparison



Most of the contamination in the oil that can damage a machine is not visible to the naked eye. The necessity to filter the oil down to 1 micron filter fineness results from the fact, that narrowest fits e. g. in hydraulic pumps, control valves and seal clearances in parts, are only one or a few micron.

Even dirt particles $< 1 \mu\text{m}$, as e. g. varnish particles resulting from oil ageing are eliminated to a great extent. This is only possible with filters functioning according to the principle of depth sedimentation. Only by eliminating most of the contaminants with a catalytic and abrasive effect the ageing process in the oil is decelerated successfully and in the ideal case even stopped.

Cleanliness classes according to ISO 4406 and NAS 1638

ISO 4406	Number of particles / 100 ml			NAS 1638
	≥ 4 µm	≥ 6 µm	≥ 14 µm	
12/10/06	4.000	1.000	64	-
12/10/07	4.000	1.000	130	1
12/10/08	4.000	1.000	250	-
13/11/08	8.000	2.000	250	2
14/12/09	16.000	4.000	500	3
15/13/10	32.000	8.000	1.000	4
16/14/11	64.000	16.000	2.000	5
16/14/12	64.000	16.000	4.000	-
17/15/12	130.000	32.000	4.000	6
18/16/13	250.000	64.000	8.000	7
19/17/14	500.000	130.000	16.000	8
20/18/15	1.000.000	250.000	32.000	9
21/19/16	2.000.000	500.000	64.000	10
22/20/16	4.000.000	1.000.000	64.000	-
22/20/17	4.000.000	1.000.000	130.000	11
22/20/18	4.000.000	1.000.000	250.000	-
23/21/18	8.000.000	2.000.000	250.000	12

We recommend to at least observe the cleanliness class ranges demanded by the component manufacturers. These are often part of the guarantee and warranty conditions.

Range of results when
KLEENOIL® by-pass filtration
is applied permanently.

Prevalent range of results when
KLEENOIL® filter systems
are applied temporarily.

Min. required cleanliness class
for high pressure
and servo hydraulic.

High contamination.

High probability of
machine breakdowns.

The cleanliness classes according to ISO 4406 and NAS 1638 are standards used in the oil and gas industry to assess the cleanliness of hydraulic fluids and lubricants. These standards measure the number and size of the particles in a fluid and classify them according to their cleanliness.

The ISO 4406 classification is based on the number of particles in three size ranges per 100 ml of fluid. The classification consists of three numbers, e.g. 20/18/15. The first number refers to the number of particles, bigger than 4 micron, the second number refers to the number of particles, bigger than 6 micron, and the third number refers to the number of particles, bigger than 14 micron. The lower the number, the higher the cleanliness of the fluid.

NAS 1638 defines 5 cleanliness classes. The particles are counted differentially in 5 size classes. Only the particle numbers that are effectively present in a certain class are indicated. The particles are not added up as it is the case in ISO 4406. After the particle counting each size range is assigned a cleanliness class between 00 and 12. The final overall assessment results from the indication of the worst of these 5 NAS numbers.

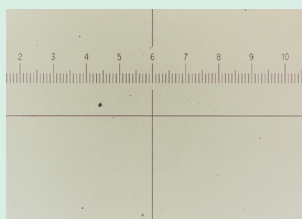
The same applies here too: The lower the number, the higher the cleanliness of the fluid.

Both standards are important to make sure that hydraulic fluids and lubricants are clean and free from harmful particles. A high cleanliness of the fluid is essential for the lifetime of machines and equipment as well as an efficient performance.

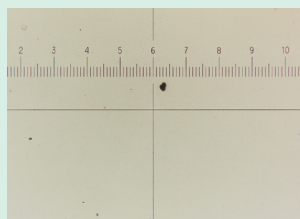
Microscopic pictures of cleanliness classes

1. Range of results when KLEENOIL® by-pass filtration is permanently applied

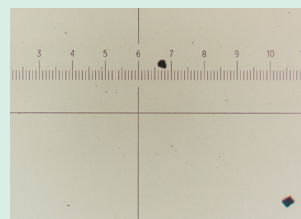
The best results can be achieved when KLEENOIL® by-pass filtration is applied permanently - in form of fix installed by-pass filters.



14/12/09*
3**



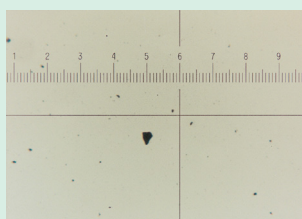
15/13/10*
4**



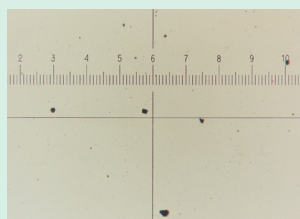
16/14/11*
5**

2. Prevalent range of results when KLEENOIL® filter systems are temporarily applied

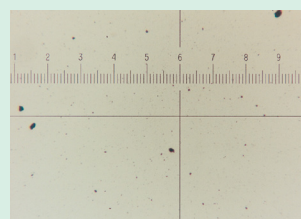
Very good results can be achieved when KLEENOIL® by-pass filter systems are applied temporarily.



17/15/12*
6**



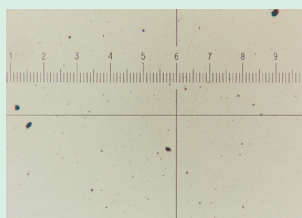
18/16/13*
7**



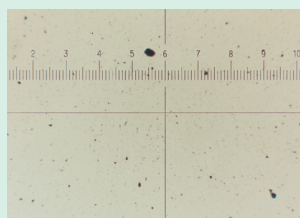
19/17/14*
8**

3. Min. required cleanliness class (tolerance range) for high pressure and servo hydraulic

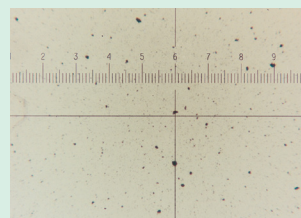
Without additional by-pass filtration the cleanliness class value of the employed oil in most of the cases is kept in a range slightly below, corresponding to or slightly above the highest admissible value.



19/17/14*
8**



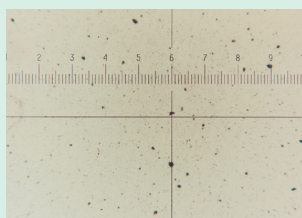
20/18/15*
9**



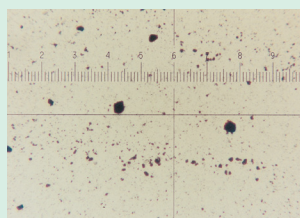
21/19/16*
10**

4. High contamination - high probability of machine breakdowns

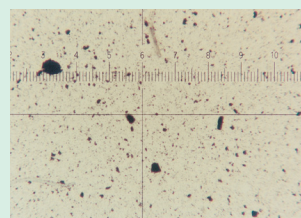
Highly contaminated oils mostly can be found when maintenance is neglected and/or machines are employed in extreme environments or under severe conditions.



21/19/16*
10**



22/20/17*
11**

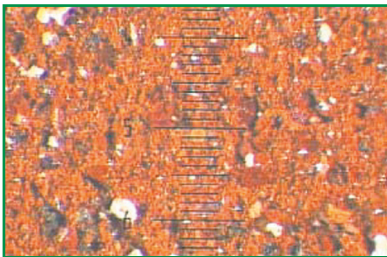


23/21/18*
12**

100 x magnification | 1 scale mark = 10 µm | * according to ISO 4406/1999 | ** according to NAS 1638/1964

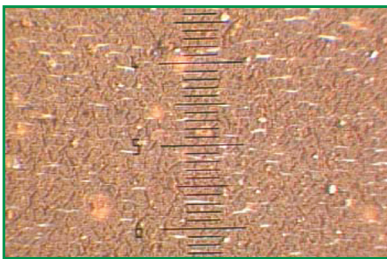
Oil contamination - origin and effects

Solid particle contamination



Mostly rust and wear particles

High wear as well as malfunctions at pumps and valves



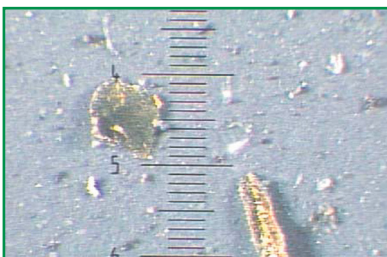
Oil ageing products, amongst others varnish

Accumulation of mud, filter blocking, system failures and accelerated oil ageing



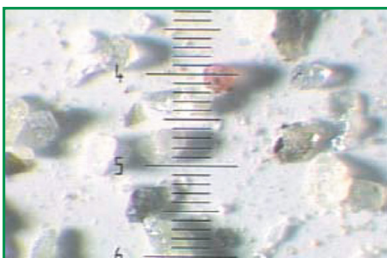
Metal swarf

High wear as well as malfunctions at pumps and valves, damage of seals, leakages



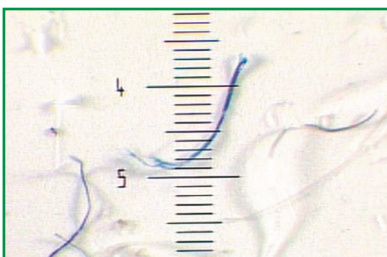
Damage particles of bronze, brass or copper

Imminent total breakdown, high wear, as well as malfunctions of pumps and valves, damage of seals



Silicate (e. g. quartz), ambient contamination (ventilation)

System failures and high component as well as seal wear



Fibres, assembly contamination, cleaning rags, etc.

Obstruction of the nozzles, leakages at valve seats

Oil contamination - origin and effects

Water contamination

Even before being used, oils are at risk of water contamination during transport and storage. Water can accumulate on the surface of upright containers (particularly drums) during outdoor storage or loading. As ambient temperatures rise and fall, moisture can be drawn into the barrel via the barrel caps.

During operation water can get into the oil through openings on the tank, as condensation from the air or through worn cylinders and seals. All in all condensation is the most common cause of water ingress into oil during operation.

In every non-water-based oil, excessive water contamination leads to direct as well as consequential damages as e. g. cavitation, corrosion, deteriorated filterability, increase of the acid content, etc. A low water content is present in practically every oil and is harmless below the maximum admissible values. Water contamination e. g. in HLP & HVLP oils is only harmful above 500 and in biodegradable ester oils (HEES) above 1.000 ppm. Above these values we recommend microfiltration with KLEENOIL® Microfiltration.

Before KLEENOIL® Microfiltration



After KLEENOIL® Microfiltration



Water contamination Solid particle contamination

Water content in hydraulic oils

Fluid type	Water content in new oils (harmless)	Max. tolerable value (according to current norms)	Filtration recommended starting from
HLP HVLP	100 - 400 ppm	500 ppm	> 400 ppm
HEES HETG HEPR	400 - 700 ppm	1.000ppm	> 900 ppm

Filter elements

Technically relevant data - type denomination and application

The indicated performance data, filter finenesses and filtration results can only be achieved, if original KLEENOIL® filter elements are used in original KLEENOIL® filter housings.

CFFC

LDFC



Application	CFU filter housing	LDU filter housing
Dirt retention capacity up to	400 g solid particles / 150 ml water	600 g solid particles / 230 ml water
Height	110 mm	112 mm
Diameter	82 mm	103 mm
Weight	143 g ± 5%	275 g ± 5%
Filter fineness	1 µm nom.	1 µm nom.
Packing unit	Box of 12	Box of 12

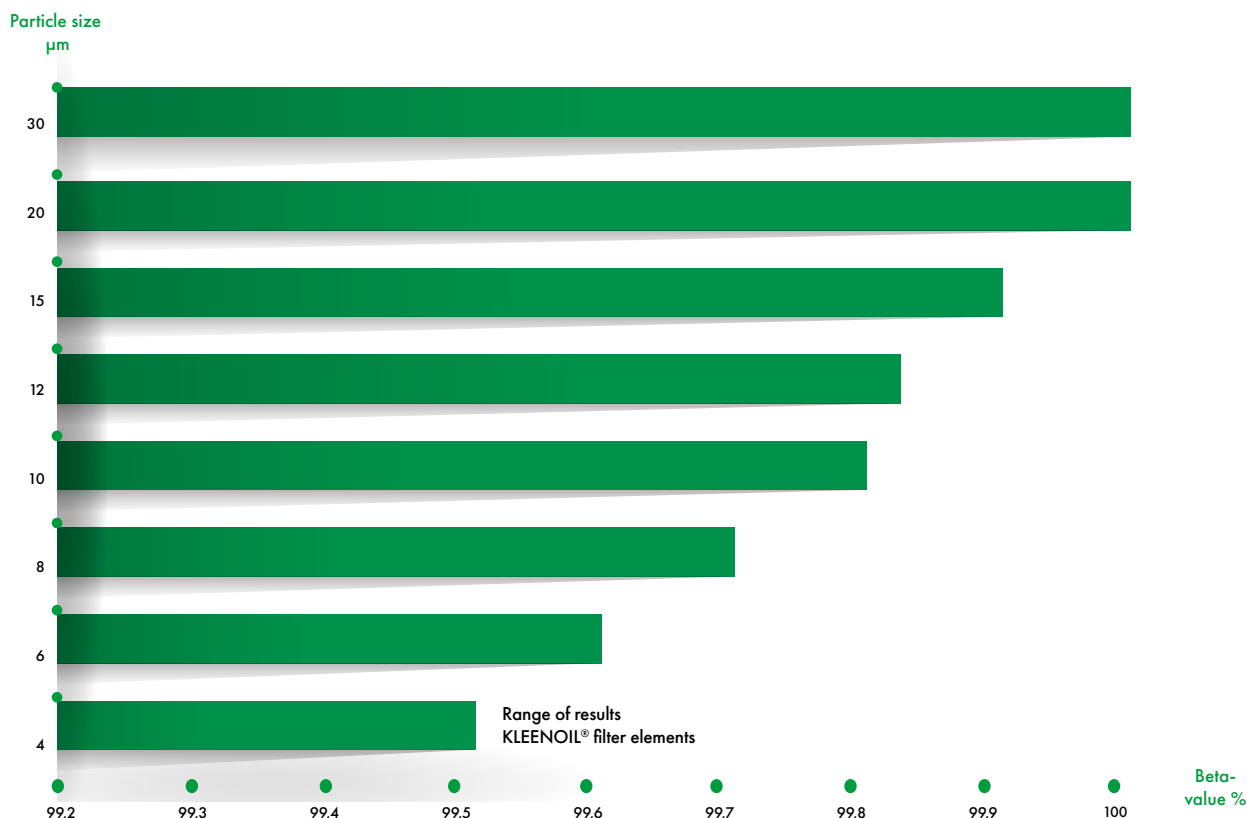
Filter elements

Warning against counterfeit copies

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HDFC-N	SDFC	SDFC-P
		
HDU filter housing	SDU filter housing & KLEENOIL® filter systems	SDU filter housing & suitable KLEENOIL® filter systems
1.000 g solid particles / 300 ml water	2.000 g solid particles / 500 ml water	2.000 g solid particles
112 mm	112 mm	110 mm
143 mm	195 mm	195 mm
500 g ± 5%	1.000 g ± 5%	1.000 g ± 10 %
1 µm nom.	1 µm nom.	< 10 µm nom.
Box of 12	Box of 6	Box of 6
		Suitable also for filtration of water based lubricants

Filtration efficiency KLEENOIL® filter elements



Retention rate / BETA value & filtration fineness

Based on the utilization of ISO MTD test particles the test results confirm that the KLEENOIL® filter elements have a retention capacity of < 4 µm in the absolute range. According to ISO 4572 (ACFTD), this corresponds to a filter fineness of 1 µm nominal.

The efficiency of a filter element is not only determined by the filter fineness, but also by the retention capacity. The result is indicated as beta (β) value. The beta value and the filtration fineness are indicated in relation to each other in the result. Due to the lack of measuring possibilities with calibrated particles < 4 µm in this case 4 µm particles are also used and the filtration fineness < 4 µm is determined arithmetically.

Basic explanations to the retention ration / beta (β) value:

The term "beta value" (β value) indicates the filter efficiency. This value qualifies the measuring unit for indication of the filtration capability of a filter

element. With the beta value the filtration efficiency in percentage is indicated, for example 2 (50%) up to 1.000 (99,9%) and is respectively valid for all particle sizes (x) or for a fix determined particle size (e. g.: β 10 = particles ≥ 10 micron).

Beta value and filter fineness of the KLEENOIL® filter element:

β 4 (ISO MTD) ≥ 200, corresponds to β 1 (ACFTD) ≥ 200, filtration fineness: 1 (4) µm nominal

The efficiency of elimination of microparticles below 1 (4) µm is given by the effect of the depth filtration of the KLEENOIL® filter elements. This anyhow cannot be indicated by a determined method because for this range there are no test-particles and accredited testing methods. The respective efficiency is proven by empirical values.

Recommended filter element changes

Application	Condition	Change Interval
Mobile machines hydraulic, engine or gear oil	normal extreme*	500 operating hours 250 operating hours
Industrial machines (indoors /continuous operation)	normal extreme*	2.000 operating hours 1.000 operating hours
Utility vehicles in short distance traffic	normal extreme*	20.000 km 15.000 km
Utility vehicles in long distance traffic	normal extreme*	60.000 km 30.000 km

*Application where equipment is under extreme load, in dusty or humid environment, or in cases where frequently there is potential for contamination to be introduced e. g. in applications where there are regular changes of attachments.



**Change set consisting of
filter element and lid seal**

IMPORTANT:
Changing the lid seal every time the SDFC filter element is changed is an option, but not imperative / not always a necessity. Undamaged / flawless lid seals can be used several times.

By-pass filters for engine oil filtration

CFU-M8



Technical parameters



For machines up to	10 litres engine oil
Input pressure	2 - max. 6 bar
Filter element	CFFC
Height	234,5 mm
Diameter	90,0 mm
Weight	1,5 kg
Thread inlet	1/8" BSP external thread
Thread outlet	1/8" BSP external thread

Connection by-pass filters

KLENOIL® filters are exclusively by-pass microfilters. The connection always has to be made in a way, that at the connection point (filter inlet) a defined pressure as well as a quantity of up to 2 litres of oil per minute are available, and that this oil quantity can be taken from the system without influencing the system or causing malfunctions. The return line (filter outlet) always has to be as short as possible, sufficiently dimensioned and lead to the oil tank without pressure.

The installation site should be chosen in a way assuring that the by-pass filter unit is positioned above the oil level. Otherwise, when changing the filter elements an oil leakage would occur through the filter housing. In case this would not be possible and the by-pass filter unit inevitably has to be installed below the oil level, then a non-return valve with a minimal response pressure has to be installed in the return line. It must absolutely be avoided that the oil flowing back gets into the open filter housings.

See datasheet for details - also available as download on www.kleenoil.com/downloads

By-pass filters for engine oil filtration

LDU-M8



HDU-M8



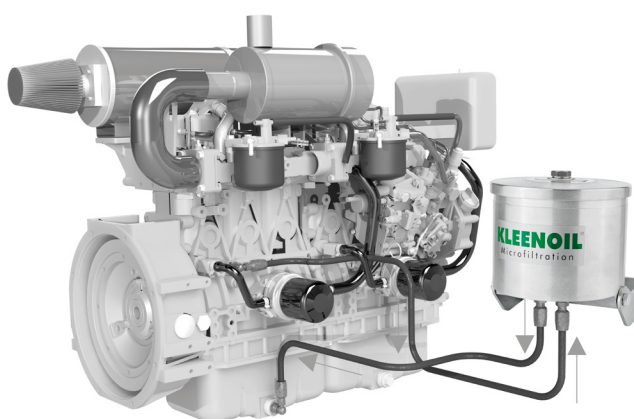
SDU-M8



15 litres engine oil	30 litres engine oil	50 litres engine oil
2 - max. 6 bar	2 - max. 6 bar	2 - max. 6 bar
LDFC	HDFC-N	SDFC
257 mm	261 mm	308 mm
123 mm	168 mm	217 mm
2,5 kg	4,7 kg	7,6 kg
1/4" BSP external thread	1/4" BSP external thread	1/4" BSP external thread
1/4" BSP external thread	1/4" BSP external thread	1/4" BSP external thread

Connection example - engine

For engine oil filtration in the by-pass exclusively filter housings with the letter M in the type denomination have to be used. They dispose of the necessary pressure protection in order to maintain an unaltered oil pressure for the microfiltration although there is an additional oil volume reduction. The number in the type denomination indicates the maximum admissible inlet pressure. Ideal results are achieved in the pressure range 1 - 5 bar (inlet).



See datasheet for details - also available as download on www.kleenoil.com/downloads

By-pass filters for hydraulic & gear oil filtration

Application in a low pressure range

CFU-H8-PG



Technical parameters

For machines up to	100 litres hydraulic oil
Input pressure	2 - max. 6 bar
Filter element	CFFC
Height	244,5 mm
Diameter	90,0 mm
Weight	1,6 kg
Thread inlet	1/8" BSP external thread
Thread outlet	1/8" BSP external thread

Connection example - gear box



See datasheet for details - also available as download on www.kleenoil.com/downloads

By-pass filters for hydraulic & gear oil filtration

Application in a low pressure range

LDU-H8-PG



HDU-H8-PG

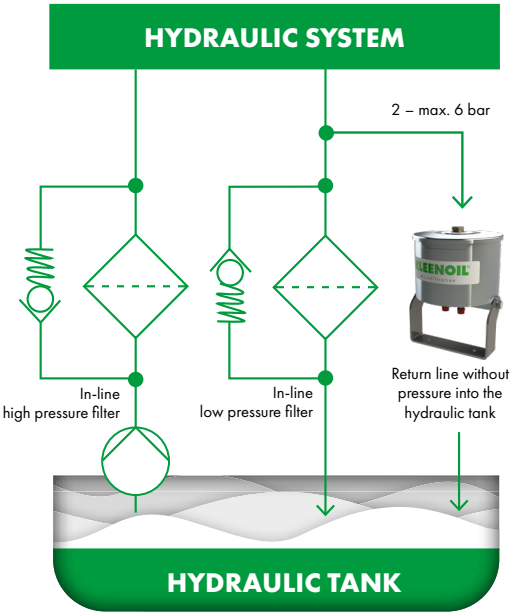


SDU-H8



200 litres hydraulic oil	300 litres hydraulic oil	500 litres hydraulic oil
2 - max. 6 bar	2 - max. 6 bar	2 - max. 6 bar
LDFC	HDFC-N	SDFC
264 mm	272 mm	308 mm
123 mm	168 mm	217 mm
2,5 kg	4,7 kg	8 kg
1/4" BSP external thread	1/4" BSP external thread	1/4" BSP external thread
1/4" BSP external thread	1/4" BSP external thread	1/4" BSP external thread

Connection example by-pass filter - hydraulic system low pressure in the by-pass



See datasheet for details - also available as download on www.kleenoil.com/downloads

By-pass filters for hydraulic oil filtration

Application in a high pressure range

LDU-H300

HDU-H300

SDU-H350



Technical parameters

For machines up to	200 litres hydraulic oil	300 litres hydraulic oil	500 litres hydraulic oil
Input pressure	5 - max. 300 bar	5 - max. 300 bar	5 - max. 350 bar
Filter element	LDFC	HDFC-N	SDFC
Height	259 mm	261 mm	308 mm
Width	-	-	-
Depth	-	-	-
Diameter	123 mm	168 mm	217 mm
Weight	4,6 kg	6 kg	9,4 kg
Connection inlet	M12 x 1,5 internal thread	M12 x 1,5 internal thread	M12 x 1,5 internal thread
Connection outlet	M18 x 1,5 internal thread	M18 x 1,5 internal thread	M18 x 1,5 internal thread

The construction components used in modern and efficient machines can only permanently maintain their accurate productive efficiency with clean operating fluids. This can be ensured with the KLEENOIL® by-pass filtration. KLEENOIL® by-pass filters offer a cost-efficient and up to date opportunity to protect operating materials and components. The installation is possible at the majority of the systems. Due to the fact, that amongst others the oil ageing process is slowed down by using KLEENOIL® by-pass filters the oil change intervals can be extended. By eliminating contaminants with abrasive effect (solid particles) the mechanical wear is minimised and by eliminating the contaminants with catalytic effects (water and metal parts) the oxidative-catalytic reactions are slowed down considerably.

See datasheet for details - also available as download on www.kleenoil.com/downloads

By-pass filters for hydraulic oil filtration

Application in a high pressure range

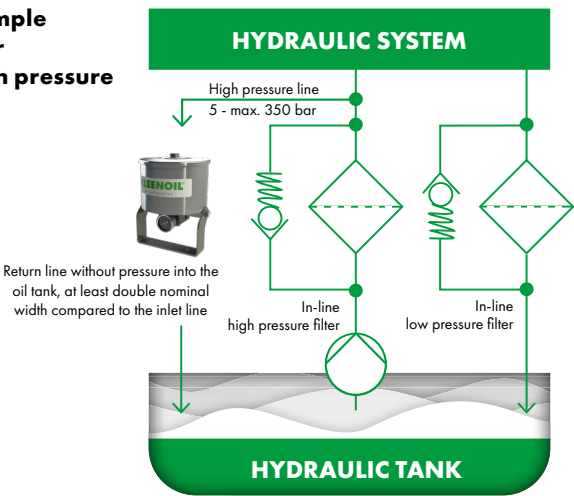
SDU-H350RK/TWIN
2S-350-C4
4S-350-C8
6S-350-C12



1.000 litres hydraulic oil	1.000 litres hydraulic oil	2.000 litres hydraulic oil	3.000 litres hydraulic oil
5 - max. 350 bar	5 - max. 350 bar	5 - max. 350 bar	5 - max. 350 bar
SDFC	SDFC	SDFC	SDFC
255 mm	328 mm	328 mm	328 mm
482 mm	570 mm	628 mm	865 mm
235 mm	238 mm	447 mm	447 mm
-	-	-	-
19,9 kg	25,0 kg	44,0 kg	62,0 kg
M12 x 1,5 internal thread	3/8" BSP external thread	3/8" BSP external thread	3/8" BSP external thread
12 L external thread with 15 L adapter internal thread	3/4" BSP external thread	3/4" BSP external thread	3/4" BSP external thread



Connection example
by-pass filter
hydraulic system - high pressure



See datasheet for details - also available as download on www.kleenoil.com/downloads

TRIPLE UNIT

By-pass filter units for filtration of three different oil circuits

The KLEENOIL® TRIPLE UNIT has been developed to filter three different oil circuits of a machine, with the same type of filter element. Each of the installed filter housings disposes of the suitable pressure protection for connection at the respective component. The connection prescriptions are the same as for the individual application of the KLEENOIL® by-pass filters. Accommodating all three by-pass filters in one stable and compact housing (TRIPLE UNIT) will simplify the oil maintenance in the practical application. The filter elements are changed in synchronized intervals.



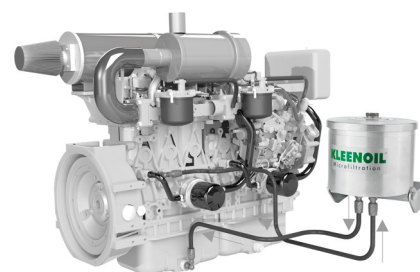
① HYDRAULIC



② GEAR



③ MOTOR



TRIPLE UNIT

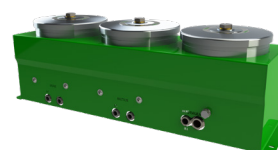
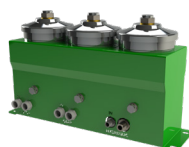
By-pass filter units for filtration of three different oil circuits

TRIPLE LDU

TRIPLE HDU

TRIPLE SDU

TRIPLE UNIT



Technical parameters

For machines up to

Engine oil	15 litres	30 litres	50 litres
Gear oil	200 litres Pressure range: 2 - max. 6 bar	300 litres Pressure range: 2 - max. 6 bar	500 litres Pressure range: 2 - max. 6 bar
Hydraulic oil	200 litres system content Pressure range: 5 - max. 300 bar	300 litres system content Pressure range: 5 - max. 300 bar	500 litres system content Pressure range: 5 - max. 350 bar
Filter element	LDFC	HDFC-N	SDFC
Height	328 mm	255,63 mm	261 mm
Width	437 mm	587 mm	805 mm
Depth	147,5 mm	189 mm	232 mm
Weight	12 kg	17 kg	40 kg
Connection inlet engine and gear oil	3/8" BSP	3/8" BSP	3/8" BSP
Connection inlet hydraulic oil	1/4" BSP	1/4" BSP	1/4" BSP
Connection outlet	3/8" BSP	3/8" BSP	3/8" BSP

See datasheet for details - also available as download on www.kleenoil.com/downloads

Filter systems for workshop & industrial deployment

230 Volt - also available as special construction with 60 HZ & 110 Volt

1S

2S



Technical parameters

Filtration performance (average value)	120 l/h (40 cSt)	220 l/h (40 cSt)
IP rating	IP 55	IP 55
Length	265 mm	621 mm
Width	430 mm	590 mm
Height	509 mm	990 mm
Weight	25 kg	60 kg

All our KLEENOIL® filter systems are equipped with a 6 metre suction and return hose including quick release couplings. Apart from the filter systems 1S all other filter systems intended for workshop and industrial deployment have a transfer connection for transfer of the oil without filtration. The filter units in the filter systems consist of our SDU filter housings including the respective filter elements. The installed pre-filters are washable.

All KLEENOIL® filter systems are suitable for the periodical cleaning, filling of new oil and filtration in the by-pass. For the hydraulic connection of the filter systems the connection points and elements are preferably chosen to allow the filtration while the systems that are to be cleaned, are in operation. The filtration time depends on the viscosity and the level of fluid contamination.

See datasheet for details - also available as download on www.kleenoil.com/downloads

Filter systems for workshop & industrial deployment

230 Volt - also available as special construction with 60HZ & 110 /380 Volt

4S	6S	8S-1000-D*	12S
			
500 l/h (40 cSt) **	500 l/h (40 cSt) **	2 x 500 l/h (40 cSt) *	1.500 l/h (40 cSt)
IP 55	IP 55	IP 55	IP 55
869 mm	1.099 mm	1.597 mm	1.249 mm
590 mm	590 mm	554 mm	797 mm
990 mm	990 mm	1.073 mm	994 mm
95 kg	110 kg	210 kg	200 kg

*only availabe with 230 and 380 Volt.

** The 4S and the 6S are fitted with an identical pump. The performance difference is visible in the result. In the 6S the same flow rate passes through a filter area / a filter volume being bigger by 1/3. This allows the 6S to achieve the filtration results approximately 40% faster (1/3 more filtration area / volume and lower operating pressure) compared to the 4S.

Based on our long-year experience we recommend to use KLEENOIL® filter systems for microfiltration of oil system contents between 50 litres (1S) and maximally 25.000 litres (12S). The filtration time first of all depends on the filtration performance of the respective filter system, in relation to the oil quantity. Furthermore the filtration time until the requested result is achieved is dependent from the viscosity, considering that a microfiltration above 100 cSt is practically no longer possible. At third place the filtration is dependent on the contamination level

of the fluid to be filtered, particularly on the quantity of water contamination. The KLEENOIL® filter systems are based on the approved KLEENOIL® filter technology. Solid particles up to 1 µm are eliminated, water (only with SDFC filter elements) absorbed from the oil and bound in the filter element.

See datasheet for details - also available as download on www.kleenoil.com/downloads

Filter systems for mobile deployment

24 Volt

1S-24V

2S-24V-GP



Technical parameters

Filtration performance (average value)	50 l/h (40 cSt)	180 l/h (40 cSt)
IP rating	IP 55	IP 55
Length	217 mm	288 mm
Width	237 mm	541 mm
Height	315 mm	574 mm
Weight	15 kg	31 kg

KLEENOIL® 24 volt by-pass microfiltration systems are designed for rotational or permanent filtration of oils in machines being in use. The application / filtration is carried out during the conventional employment of the machine. This way it can be assured that the complete system is cleaned / kept clean.

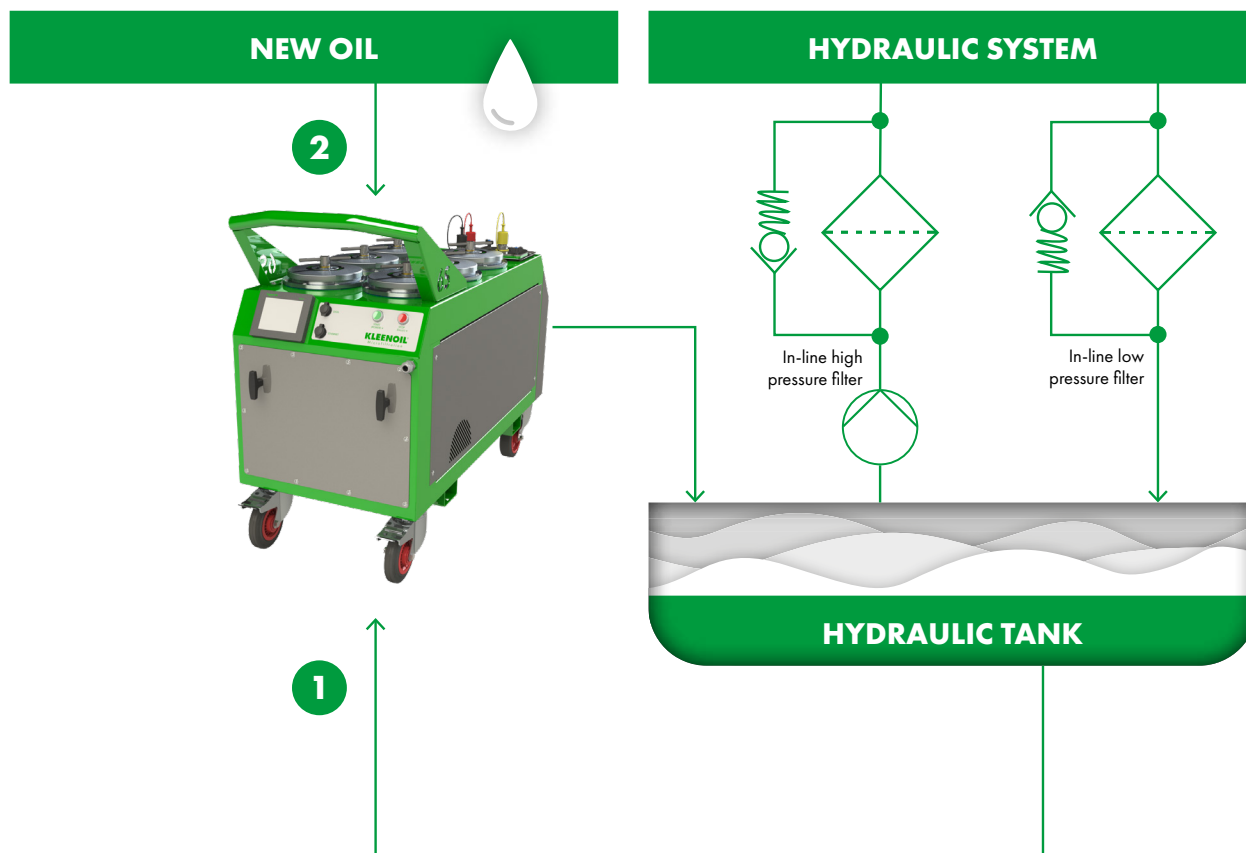
The hydraulic connection of a KLEENOIL® 24 volt filter system is made as shown on the schematic **1**. Like the other KLEENOIL® filter systems, too, the 24 volt filter systems have to be connected to the tank directly, i.e. neither the inlet nor the outlet hoses have to be connected to the existing hoses and lines on the machine. The hydraulic connection has to be made exclusively at the tank.

See datasheet for details - also available as download on www.kleenoil.com/downloads

Connection filter systems

Schematic pictures for two types of application

All KLENOIL® filter systems are employed for permanent and rotational oil maintenance ① and/or filling of new oil ② .



Duration and frequency of the filtration are dependent on the level of fluid contamination, the type of construction and the employment of the machine. It is important to observe that during the filtration all system functions have to be carried out intensely and frequently enough. Only if during the filtration time the entire system volume is circulated several times it can be ensured, that the contamination in the oil is removed by the filter system.

INTEGRATED FLUID CONCEPT

Brief description

Oil change intervals in the majority of cases are determined empirically and oil changes are realized without taking into consideration the real quality of the lubricant. This causes unnecessary costs. If an oil change is done too early, a still flawless lubricant is disposed of. If an oil change is done too late, machine damages can occur. The ideal case would be to do oil changes depending on the condition.

The INTEGRATED FLUID CONCEPT predominantly has been designed for the application areas of hydraulic, engine and gear oils. The complete concept consists of three components:

1. Oils suitable for long term use

Best results can be achieved with high-performance, shear-stable oils being suitable for long-term use. Regarding the rapidly biodegradable oils these mostly are products based on saturated, synthetic esters.

2. Microfiltration in the by-pass

The application of KLEENOIL® Microfiltration contributes to the reduction of system failures, wear and breakdowns. The ageing process of the fluid is slowed down, because with the KLEENOIL® filter elements solid particles and water are eliminated from the oil.

3. Oil quality monitoring in real-time

The oil analysis sensor KLEENOIL /CC® (Identification Contamination Control) has been designed for on-board oil analysis indicating the condition of the oil during the operation of the machine every 30 minutes (standard model). The system is available with digital outlet so that a digital data processing and/or remote monitoring is possible.

Advantages

Compared to periodical oil change intervals the INTEGRATED FLUID CONCEPT offers best security. In the INTEGRATED FLUID CONCEPT the oil is considered as construction element and its excellent "ability of carrying information" is taken advantage of. Most of the changes in the machine can be detected in the oil.

KLEENOIL /CC® is employed to detect the oil condition. Preferably we recommend the employment of KLEENOIL /CC® integrated in a SDU filter unit. These filter units by the majority are used as high performance by-pass filter units for diverse application fields.

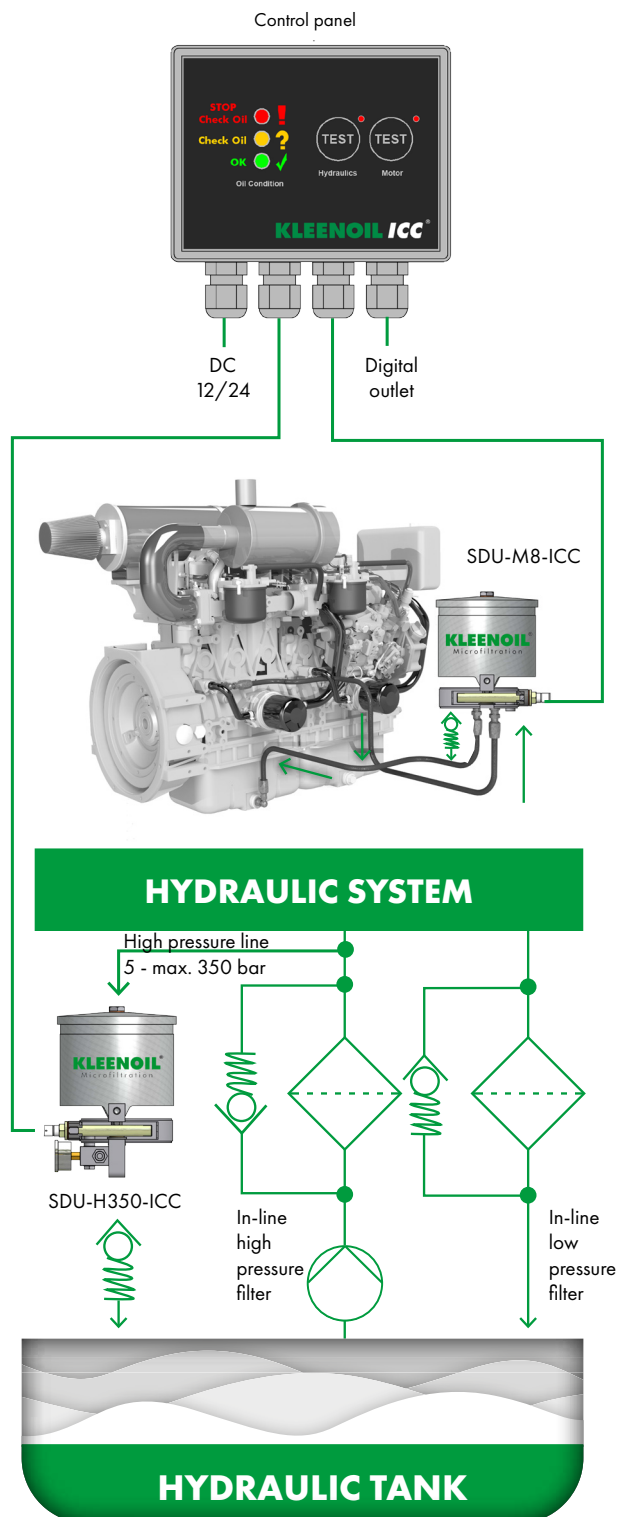
In hydraulic systems (up to approximately 500 litres system content) mostly the high pressure by-pass filter SDU-H350 is used. For filtration of engine oils in most of the cases the by-pass filter SDU-M8 is used. All these filter units, as additional, integral part can be complemented with a KLEENOIL /CC®. It is installed in particularly constructed flow-containers (oil flow after the filtration).

In the adjacent schematic example the INTEGRATED FLUID CONCEPT for engine and hydraulic oil with the respectively installed by-pass filtration and integrated KLEENOIL /CC® is shown.

See datasheet for details - also available as download on www.kleenoil.com/downloads

INTEGRATED FLUID CONCEPT

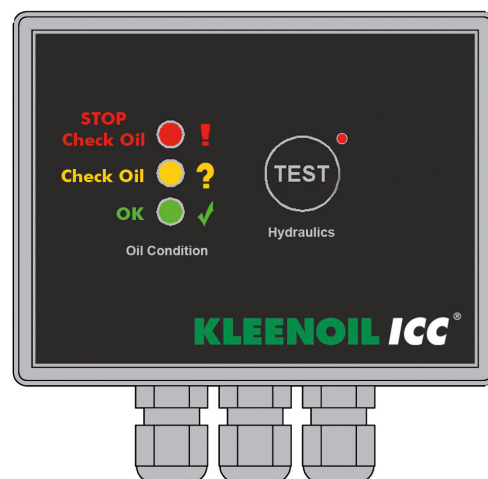
Schematic



KLEENOIL ICC®

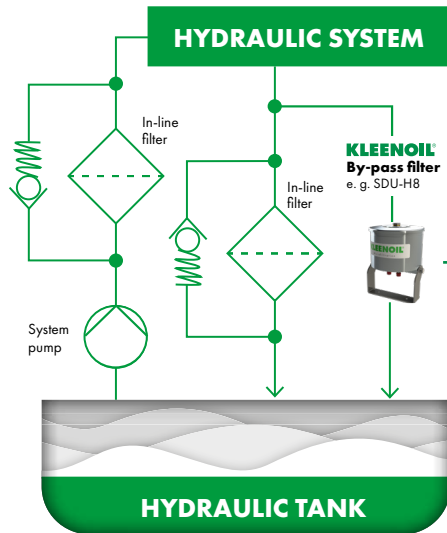
KLEENOIL ICC® - Identification Contamination Control is an on-board oil analysis sensor which has been designed for the continuous monitoring of vital parameters that cause an application relevant change of the fluid. To collect the data the KLEENOIL ICC® uses a capacitive sensor to read the quality of the oil in comparison to the saved calibration. Based on the change of the oil dielectric the actual or rather the still existing oil quality or contamination is shown as a final result.

Most application relevant oil values are dependent on each other and this also applies to their changes. For this reason the KLEENOIL ICC® and its installed measuring and analysis principle have been designed for the reading and monitoring of the overall condition.

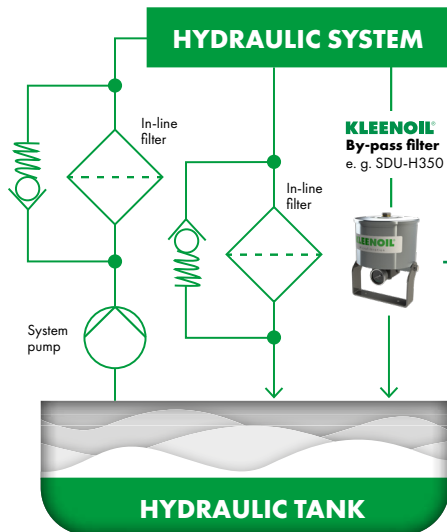


During the operation of the machine the condition of the oil is checked every 30 minutes. The results are shown on the control panel in an easy and understandable way using the "traffic light principle". The evaluating unit disposes of a digital connection to allow an implementation of the indicated signals in the on-board electronics of a machine and the connection to a remote monitoring system.

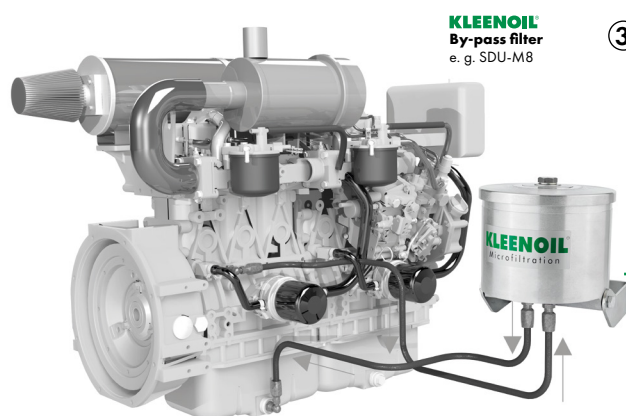
Application examples by-pass filters



① Hydraulic oil filtration in a low pressure range



② Hydraulic oil filtration in a high pressure range

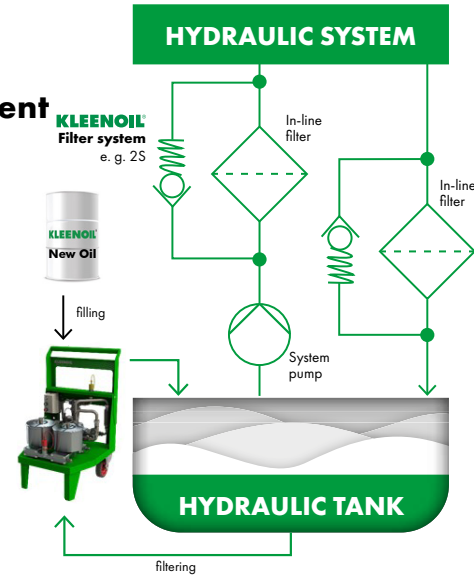
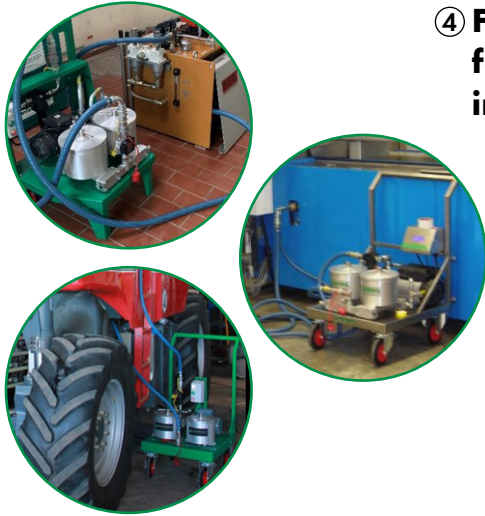


③ Engine oil filtration

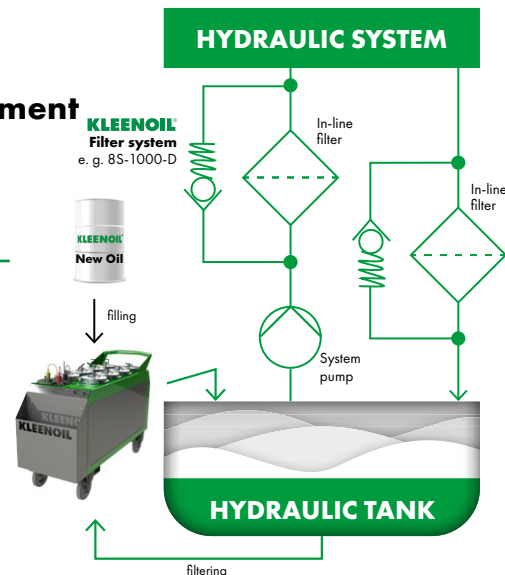
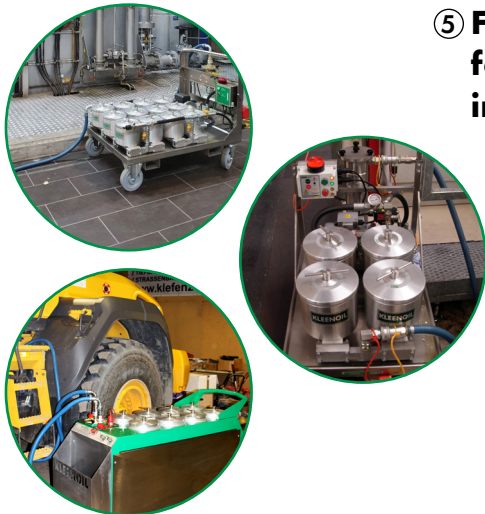


Application examples filter systems

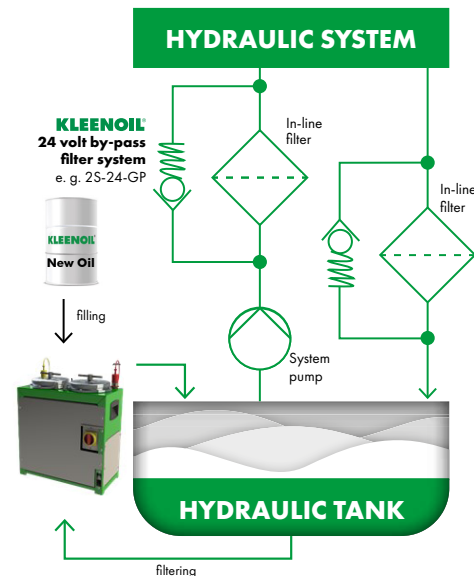
④ Filter systems for workshop & industrial deployment



⑤ Filter systems for workshop & industrial deployment



⑥ Mobile 24 volt filter systems



“

Progress is the return to
the laws of nature.

Milorad Krstić, Company Founder KLEENOIL AG

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