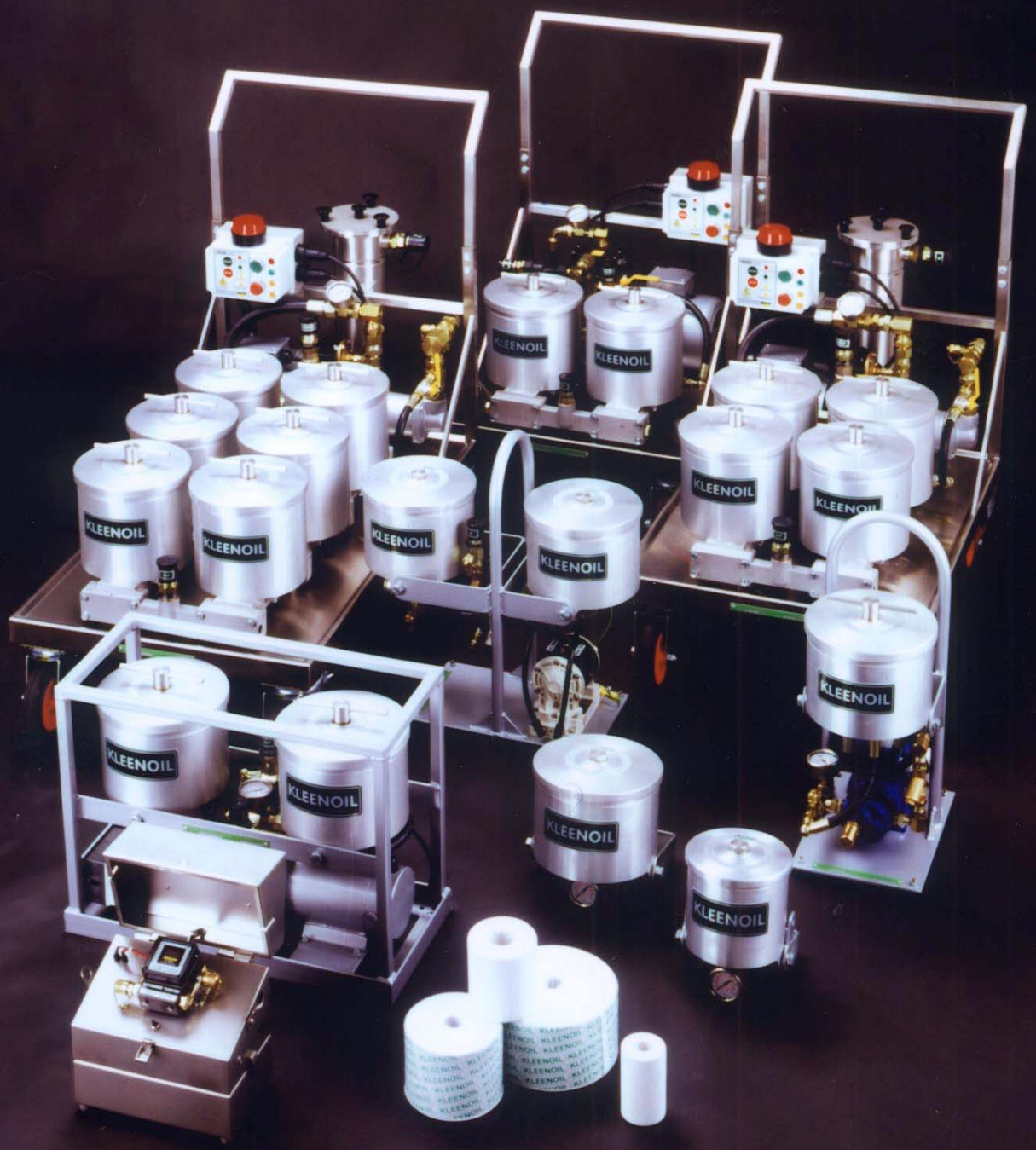


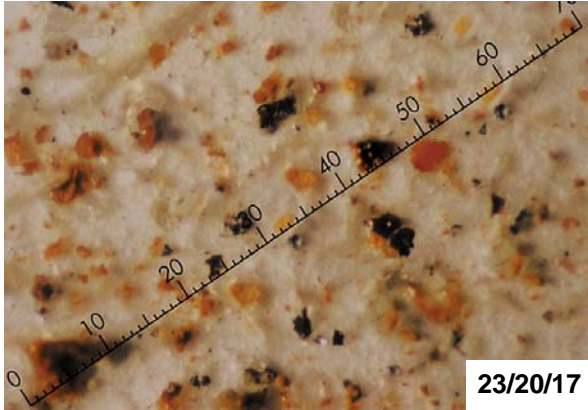
KLEENOIL

Microfiltration



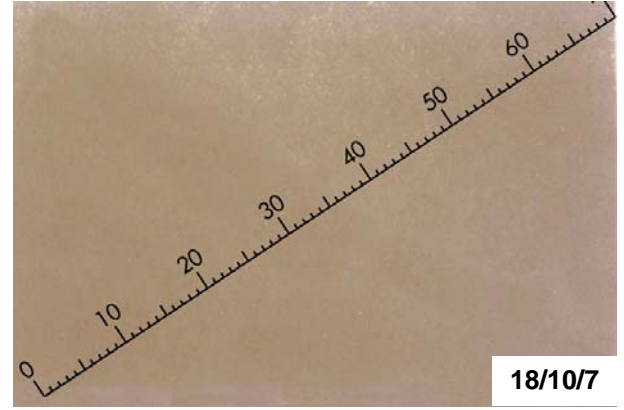
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BEFORE



Oil photograph 100 x magnification
- after 2.000 operating hours in a hydraulic excavator -

AFTER



Oil photograph 100 x magnification
- after filtration with a KLEENOIL filter rig -

KLEENOIL micron filtration systems have been developed for the maintenance of hydraulic and lubricating oils using the by-pass method. The **KLEENOIL depth filters** have excellent particle retention and water absorption capabilities. **KLEENOIL oil maintenance** is the best solution for **extended oil life** and **oil change intervals** whilst providing excellent system **component protection**. Extended oil change intervals provide savings in natural resources and reduce old oil disposal, a **pro-active environmental policy**.

KLEENOIL FILTRATION SYSTEMS - SUMMARY

PRODUCT CODE	FILTER ELEMENTS (packing unit)	APPLICATIONS All filter rigs are suitable for filling of new oil.	PERFORMANCE		VOLTAGE INPUT SOURCE	PUMP PERFORMANCE		WORKING PRESSURE in bar	MAX. PRESSURE in bar	
			litres/h 40 cSt.	Cleanliness class ISO 4406 (1987)		litres/h 40 cSt.	Max. suction			
FILTER RIGS	Alternating current	1S-120PG	Small machines / oil systems up to 400 litres.	120	= 14/11/8	230 V	120	2,5 m	4	
		1S-250		250			700			
		2S-500 B* / 2S-500E	Medium sized machines / oil systems up to 1.000 litres.	500		230 V		5,5 m		
		3S-700B		700						
		4S-1200 B/E* / 4S-1200E	Medium sized to large machines / oil systems up to 7.000 litres.	1200		230 V / 380 V	1600			
	6S-1500 B/E* / 6S-1500E	Large machines / oil systems up to 10.000 litres.	1500							
	Air pressure	SDFC (boxes of 6)	For cleaning of fluids where there is a risk of explosion respectively where no electricity is available / electricity may not be used	= 14/11/8	250	Air pressure 1,5 – 7 bar	500	2,5 m		
					500					
					1200					= 12/9/6
					1500					
Direct current	SDFC (boxes of 6)	- Cleaning of mobile equipment using the by-pass method whilst working - Oil systems up to 250 litres. - Cleaning of mobile equipment using the by-pass method whilst working - Oil systems up to 1.500 litres. - Cleaning of mobile equipment using the by-pass method whilst working - Oil systems up to 3.000 litres. - Cleaning of mobile equipment using the by-pass method whilst working. - Oil systems > 3.000 litres.	= 13/10/7	250	24 (12) V	700	5,5 m			
				500						
				900						
				1200						
BY-PASS FILTERS	SDU-H350 BM2 (BM4)	By-pass filter for hydraulic oil	120 (240)	< 15/12/9	maximum inlet pressure 350 bar	-	-	2 – 6	350	
	SDU-(H/M)8	By-pass filter hydraulic or motor oil	180		maximum inlet pressure 8 bar	-	-	1 – 6	8	
	HDU-H 300	By-pass filter for hydraulic oil	120	-	maximum inlet pressure 300 bar	-	-		300	
	HDU-(H/M)8	By-pass filter for hydraulic or motor oil		-	maximum inlet pressure 8 bar	-	-	8		
	LDU-(H/M)8	LDFC (boxes of 12)	By-pass filter for hydraulic or motor oil	70	-	-	-	1 – 5	50	
	MFU-50	MDFC (boxes of 12)	By-pass filter for hydraulic or motor oil	50	< 15/12/9	maximum inlet pressure 50 bar	-			-

*basic model, without electronic controls

COMPACT FILTER RIGS FOR UNIVERSAL DEPLOYMENT



KLEENOIL
Filter rig
1S-120PG



KLEENOIL
Filter rig
1S-250



KLEENOIL
Filter rig
2S-500B



KLEENOIL
Filter rig
2S-500E

The **KLEENOIL** filter rigs of the production series **1S-120PG** to **2S-500E** are suitable for cleaning and filling of machines with oil systems up to 1.000 litres. The filtration time is depending on the viscosity and the grade of fluid contamination.

RECOMMENDATION: A minimum of 5 or more complete passes of the oil volume through the system.

With the standard SDFC filter cartridges all mineral oil based and synthetic, non water soluble lubricating and hydraulic oils up to 200 cSt. (indication of performance at 40 cSt.) as well as diesel, RME and fuel oil can be filtered. For filtration of water mixable fluids SDFC-P filter cartridges have to be used. (see page 8)

TECHNICAL DATA		1S-120PG	1S-250	2S-500B	2S-500E
Motor	Volt	230		230 / 380	
	KW	0,09	0,18		
	Amps	0,9	2,3	2,3 / 0,7	
	RPM	1400	1425		
	Protection	IP 55			IP 65
Performance	Filtration/litres/h 40 cSt.	120	250	500	
	Pump transfer/litres/h 40 cSt.	120	700		
	Temperature	10 – 90 °C		10 – 60 °C	
	Suction lift	4 m	5,5 m		
Size	Length mm	350	520		700
	Width mm	240	520	560	595
	Height mm	550	950		1000
	Without handles mm	-	545		780
	Weight kg	22	40	45	60
Filter	Housing type:	1 x SDUFB-BN		2 x SDUFB-BN	2 x SDUFB-C
	Cartridge type: micro cartridge	1 x SDFC		2 x SDFC	
	Pre-filter: small – fitted	-	PF 34 NPT		
Special options	-	Large suction pre-filter Flowmeter	3-phase motor Large suction pre-filter Flowmeter	3-phase motor Large suction pre-filter Flowmeter	



KLEENOIL
Filter rig
4S-1200B/E



KLEENOIL
Filter rig
4S-1200E



KLEENOIL
Filter rig
6S-1500B/E



KLEENOIL
Filter rig
6S-1500E

The **KLEENOIL filter rigs of the production series 4S-1200B/E to 6S-1500E** are suitable for cleaning and filling of machines with middle sized and large oil systems (500 – 10.000 litres). The filtration time is depending on the viscosity and the grade of fluid contamination.

RECOMMENDATION: A minimum of 5 or more complete passes of the oil volume through the system.

With the standard SDFC filter cartridges all mineral oil based and synthetic, non water soluble lubricating and hydraulic oils up to 200 cSt. (indication of performance at 40 cSt.) as well as diesel, RME and fuel oil can be filtered. For filtration of water mixable fluids SDFC-P filter cartridges have to be used. (see page 8).

TECHNICAL DATA		4S-1200B/E	4S-1200E	6S-1500B/E	6S-1500E
Motor	Volt	230 / 380			
	KW	0,37			
	Amps	4 / 1,3			
	RPM	1425			
	Protection	IP 55	IP 65	IP 55	IP 65
Performance	Filtration/litres/h. 40 cSt.	1200 / 2,6 bar		1500 / 2,6 bar	
	Pump transfer/litres/h 40 cSt.	1600			
	Temperature	10 – 90 °C			
	Suction lift	5,5 m			
Size	Length mm	875	950	1105	1180
	Width mm	595			
	Height mm	1000			
	Without handles mm	780			
	Weight kg	95	103	107	115
Filter	Housing type:	4 x SDUFB-C		6 x SDUFB-C	
	Cartridge type: micro cartridge	4 x SDFC		6 x SDFC	
	Pre-filter: small – fitted large – fitted	PF 34 NPT -	- G09P-1 to 100	PF 34 NPT -	- G09P-1 to 100
Special options	3-phase motor Large suction pre-filter Flowmeter	3-phase motor Flowmeter	3-phase motor Large suction pre-filter Flowmeter	3-phase motor Flowmeter	

AIR OPERATED FILTER RIGS



KLEENOIL
Filter rig
1S-250P-Air



KLEENOIL
Filter rig
2S-500P-Air



KLEENOIL
Filter rig
4S-1200E-Air



KLEENOIL
Filter rig
6S-1500E-Air

The **air operated KLEENOIL filter rigs of the production series 1S-250P-Air to 6S-1500E-Air** are designed for cleaning and filling of operating fluids (e.g. lubricating or hydraulic fluids, fuels etc.) if electricity is not available as a power source or if due to risk of explosion only specially protected rigs may be used. The most frequent fields of application are the chemical industry, tank farms and tank cleanings.

With the standard SDFC filter cartridges all mineral oil based, synthetic and non water soluble lubricating and hydraulic oils up to 200 cSt. (indication of performance at 40 cSt.) as well as diesel, RME and fuel oil can be filtered. For the filtration of water mixable fluids and / or aggressive fluids SDFC-P filter cartridges (filter media polypropylene) have to be used. (see page 8).

For continuous operation an air pressure between minimum 1,5 to max. 7 bar and an air pressure quantity of 0,1m³ to 0,8 m³ per minute has to be available.

TECHNICAL DATA		1S-250P-Air	2S-500P-Air	4S-1200E-Air	6S-1500E-Air
Compressed air unit	Max. inlet pressure	7 bar		1,5 bar	
	Admissible quantity of compressed air m ³ /Min.	0,125		0,72	
	RPM	variable		max. 1450	
	Protection	ATEX 11 2G		ATEX 11 2G Dc T5	
Performance	Filtration/litres/h 40 cSt.	250 at 2,5 bar	500 at 2 bar	1200 at 2,6 bar	1500 at 2 bar
	Pump transfer/litres/h 40 cSt.	500	700	1600	
	Temperature	10 – 82 °C		10 – 90 °C	
	Suction lift	2,5 m		5,5 m	
Size	Length mm	340	540	950	1180
	Width mm	240		595	
	Height mm	585		1000	
	Without handles mm	-		780	
	Weight kg	16	25	106	119
Filter	Housing type:	1 x SDUFB-BN	2 x SDUFB-BN	4 x SDUFB-C	6 x SDUFB-C
	Cartridge type: micro cartridge	1 x SDFC	2 x SDFC	4 x SDFC	6 x SDFC
	Pre-filter: small – fitted large – fitted	-	-	PF 34 NPT -	
	Special options	-		Large suction pre-filter Flowmeter	



KLEENOIL
Filter rig
1S-24V-250



KLEENOIL
Filter rig
2S-24V-500



KLEENOIL
Filter rig
3S-24V-900

Hydraulic oil cleaning in mobile hydraulic installations during system operation is the **most effective method for cleaning** without spending additional working hours for this purpose. KLEENOIL 24V by-pass filter rigs are used for cleaning of new machines (fabrication residues) and for continuous oil maintenance in used machines. Compact and robustly constructed, the system provides excellent service in every situation.

RECOMMENDATION: Duration and frequency of filtration until the required cleanliness class is reached depend on the grade of contamination, the type of construction and the use of the machine. After repair, the system should be cleaned as the remaining contamination could cause further failures and increased wear.

The **cleaning of new machines prior to use avoids system breakdowns**. The cleaning with a KLEENOIL by-pass filter rig is essential **after system noise has occurred, when the temperature or foaming of the fluid rises as well as after a damage / repair**. Contamination remaining in the system could cause further failures and increased wear.

TECHNICAL DATA		1S-24V-250		2S-24V-500		3S-24V-900	4S-24V-1200
		12 Volt operation	24 Volt operation	12 Volt operation	24 Volt operation	24 Volt operation	24 Volt operation
Motor	Volt	12	24	12	24	24	
	KW	0,07	0,18	0,07	0,18	0,37	
	Amps	8,5	10,3	8,5	10,3	18	
	RPM	750	1500	750	1500	1500	
	Protection	IP 55					
Performance	Filtration/litres/h 40 cSt.	125	250	250	500	900	1200
	Pump transfer/litres/h 40 cSt.	350	700	350	700	1600	
	Temperature	10 – 95 °C					
	Suction lift	5,5 m					
Size	Length mm	430		575		816	750
	Width mm	265					
	Height mm	450					
	Weight kg	35		40		85	94
Filter	Housing type:	1 x SDUFB-BN		2 x SDUFB-BN		3 x SDUFB-BN	4 x SDUFB-BN
	Cartridge type: micro cartridge	1 x SDFC		2 x SDFC		3 x SDFC	4 x SDFC
Special options		Anti-Vibration-Kit				Electronic-Package	

KLEENOIL BY-PASS FILTERS

The **KLEENOIL By-pass filters** even after having been successfully used for several decades will continue to meet future requirements due to continuous developments and improvements.

Three essential reasons for fitting a **KLEENOIL By-pass filter** are:

1. The components used in modern efficient machines can only achieve the correct performance level if the operating systems are cleanly maintained.
2. Many lubricating and pressure fluids are suitable for high stress and long life. These characteristics are being destroyed by solid and liquid contaminants. Clean systems enable the oil additives to work for longer periods before depletion.
3. Following current estimations the earth has only limited petroleum resources. The long-time employment of lubricating and pressure fluids therefore contributes to the urgent **protection of these resources**.

The **KLEENOIL By-pass** filters with cost saving and life extension possibilities are essential for plant care and maintenance. The fitting is very basic and is possible in all hydraulic systems and diesel motors.

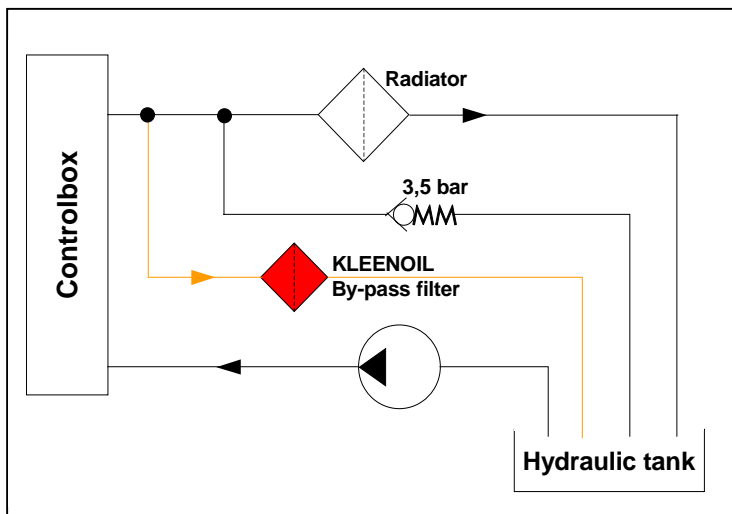
KLEENOIL filters are depth cartridges. The filter medium is made of long fibre cellulose and polypropylene. This high quality filter medium and the specially aligned construction of the filter housing grant a high particle retention capability and very effective filtration of non-emulsified water. **Solid particles up to < 1µm are filtered out and water (up to the absorption point) is bound within the cartridge element.** The filtration is carried out at low pressure – off-line – with pressures between 1 and max. 6 bar. **The additives in the oil are not removed by the KLEENOIL filter element.** The filtration of the abrasive and catalytic contamination, reduces wear and prevents oxidative-catalytic reactions. Oil change intervals will depend on the performance grade of the oil and the current application of the machine. These intervals can be extended by using KLEENOIL by-pass filters. **Through laboratory analyses the correct change frequency for the filter and the oil can be determined.**

Experience has shown that with KLEENOIL by-pass filters the **oil change intervals can be extended by at least 3 to more than 10 times.**

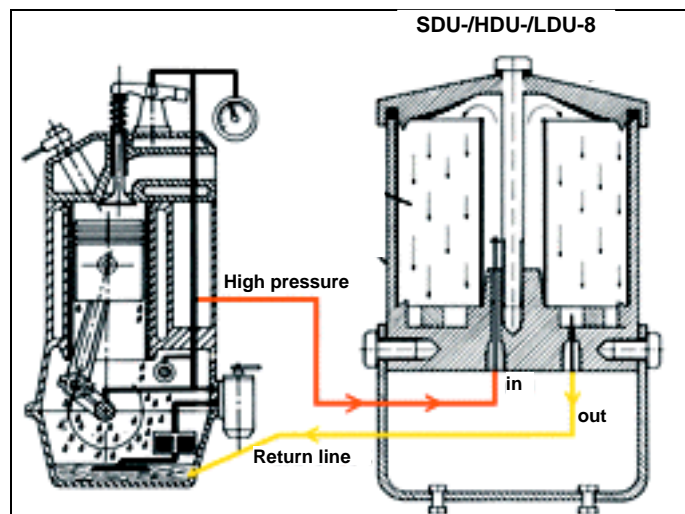
KLEENOIL BY-PASS FILTERS - SPECIFICATIONS

FILTER TYPE	FITTING RECOMMENDATION	litres / h 5 bar at 40 cSt.	FILTER ELEMENT	DIMENSIONS		CONNECTION THREAD		WEIGHT in kg
				Height in mm	Ø in mm	IN	OUT	
SDU-H350 BM2 (BM4)	By-pass filter for hydraulic oil 5 – 350 bar inlet pressure Back pressure 0 – 1 bar System content hydraulic oil 400 ltrs	120	SDFC	311	239	internal thread M 12 x 1,5	external thread M 18 x 1,5	7,5
SDU-(H/M)8	By-pass filter for hydraulic and motor oil 2 – 6 bar inlet pressure Back pressure max. 0,5 bar System content hydraulic oil 400 ltrs resp. motor oil 40 ltrs and/or 400 KW	180				external thread 1/4" BSP		6,0
HDU-H300	By-pass filter for hydraulic oil 5 – 300 bar inlet pressure Back pressure 0 – 1 bar System content hydraulic oil 200 ltrs	120	HDFC-N	272	190	internal thread M 12 x 1,5	external thread M 18 x 1,5	3,0
HDU-(H/M)8	By-pass filter for hydraulic and motor oil 2 – 6 bar inlet pressure Back pressure max. 0,5 bar System content hydraulic oil 200 ltrs resp. motor oil 30 ltrs and/or 300 KW					external thread 1/4" BSP		
LDU-(H/M)8	By-pass filter for hydraulic and motor oil 2 – 6 bar inlet pressure Back pressure max. 0,5 bar System content hydraulic oil 100 ltrs resp. motor oil 15 ltrs and/or 150 KW	70	LDFC	245	145	external thread 1/4" BSP		1,5
MFU-50	By-pass filter for hydraulic and motor oil 2 – 6 bar inlet pressure Back pressure max. 0,5 bar System content hydraulic oil 50 ltrs resp. motor oil 10 ltrs and/or 100 KW	50	MDFC	220	90	external thread 1/4" BSP		1,1

1. Schematic of hydraulic installation



2. Motor installation



APPLICATIONS:



SDU-H 350
(see page 9)



SDU-(H/M)8 / SDFC



MFU-50 / MDFC



HDU-H 300



HDU-(H/M)8 / HDFC-N



LDU-M 8 / LDFC

The type of filter selected is dependant on the application or the amount of oil (see page 7). For machines with more than 200 litres system content (hydraulic / gear) and motors > 300 KW only one or several **KLEENOIL by-pass filters of the SDU-production series** are installed.

KLEENOIL - CARTRIDGE TYPES - SUMMARY

TYPE	CLEANLINESS CLASS*	APPLICATION	RETENTION LEVEL		MAX. TEMPERATURE °C	HEIGHT mm	Ø mm	WEIGHT g	PACKING UNIT	FILTER MEDIUM	FILTER-FINENESS
			Dirt particles in g	Water in ml							
SDFC	NAS-class = 5 ISO 4406 = 11/9/6	All KLEENOIL filter rigs By-pass filter SDU-H 350 / (H/M) 8	up to 2500	780	95	112	195	1000 ± 5%	box of 6	Paper + Polyester	1 µm nom.
HDFC-N		By-pass filter HDU-(H/M) 8	up to 1000	370			143	500 ± 5%			
LDFC		By-pass filter LDU-(H/M) 8	up to 600	230			103	225 ± 5%	box of 12		
MDFC		By-pass filter MFU-50	up to 150	95			72	100			
SDFC-P		All KLEENOIL filter rigs for filtration of water mixable lubricants	up to 2500	-	100	195	800 ± 5%	box of 6	Polypropylene	≈ 10 µm	

*according to ISO 4406 (1987); is achieved permanently if interpreted correctly and the filter cartridges are changed periodically.

BY-PASS FILTER SDU-H 350 / SDU-H 350 RK-TWIN

RECOMMENDED INSTALLATION

The SDU-H 350 can be installed in all hydraulic systems.

Requirements:

1. Inlet pressure up to max. 350 bar,
2. The return line has to lead directly to the tank - no dynamic pressure,
3. At the connection point it has to be possible to take 2 (BM2) respectively 4 (BM4) litres of oil per minute without affecting the function of the machine.



RECOMMENDATION FOR INSTALLATION

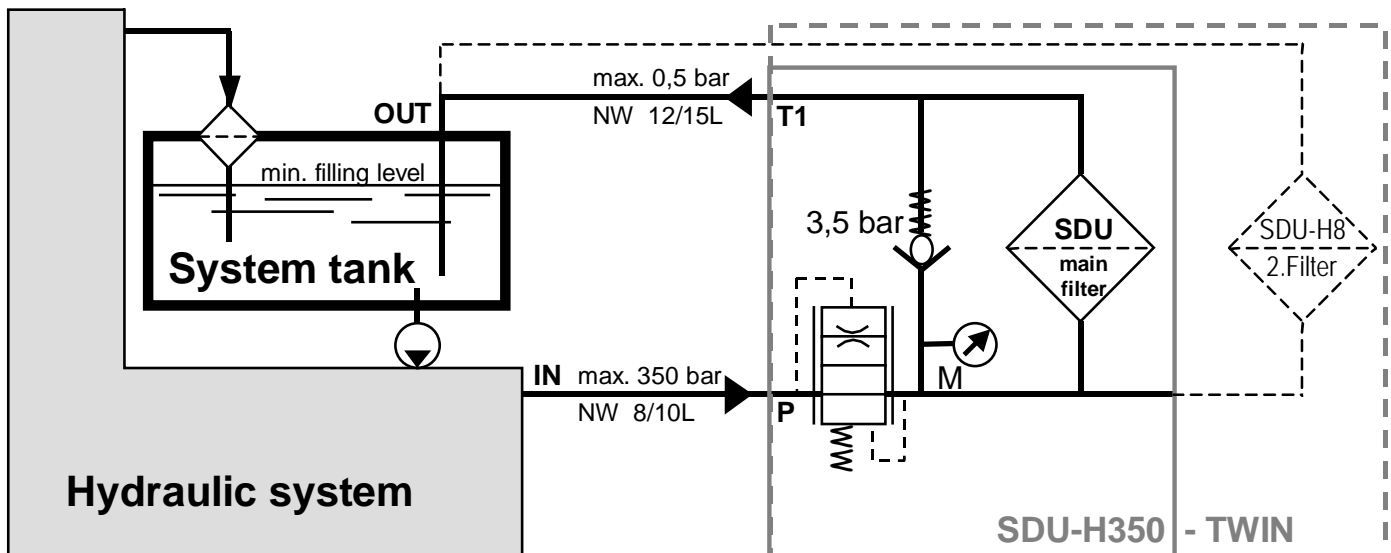
The unit should be installed so that the **return line is as short as possible** (avoid dynamic pressure). The by-pass filter should be mounted above the oil level. If this is not possible a minimum pressure non-return valve should be fitted in the return line to stop oil flowing back from the tank during cartridge changes.

FOR BIG MACHINES

For systems with more than 400 litres of oil a double filter unit SDU-H 350 TWIN is installed. This double unit can also be installed separately and has to consist of a SDU-H 350 BM4 (main unit) and a SDU-H8 (additional unit). The hydraulic connection has to be made according to the connection scheme.



CONNECTION SCHEME (simplified representation)



RECOMMENDATION FOR FILTER CHANGE

For use in **normal conditions** we recommend a **filter change every 500 – 1.000 operating hours** and for use in **severe conditions every 250 – 500 operating hours**. The **maximum filter element life is 6 months**.



The particle counter PMB 4000 is a self contained battery operated portable analyser. The instruments and its accessories are housed in a rugged stainless steel enclosure. The PMB 4000 has been developed to be a quick, uncomplicated system to establish the particle contamination within operating fluids. The construction is rugged and the functions have been limited to the essential.

The equipment can be directly connected to each minimesse-connection point with a pressure between 0,3 up to max. 500 bar. Two minimesse hoses (1 m each) with couplings (thread 16 x 2 mm) are contained in the standard delivery.

SHORT DESCRIPTION AND SPECIFICATION

The PMB 4000 operates on the principle of light extinction. An LED display is incorporated to give direct readings of oil contamination and operating parameters of the instrument.

The instrument is powered by means of a 12V rechargeable battery. The battery is contained within the enclosure together with a fuse. An on/off switch and battery charging socket is also provided. The battery charger which is fully automatic operates from a 230V ac mains supply.

Additionally a detachable fibre optic lead is provided to enable data to be downloaded to a personal computer using software provided on a CD.

TECHNICAL DATA		PMB 4000	
System		Optical particle counter with volume power and temperature controls	
Operation		Light – Extinction – Principle	
Sensor		Optical sensor with LED display for particle size 4, 6, 14 and 21 µm (ISO MTD); integrated alarm compatibility with flashing light to indicate out of pre-set cleanliness volume	
Set up time		2 – 5 minutes	
Reading interval		each 5 minutes	
Minimum operating pressure		0,3 bar	
Maximum operating pressure		500 bar	
Maximum fluid temperature		+85°C	
Ambient temperature		-20°C to +60°C	
Fluid viscosity		> 2 cSt	
Fluid compatibility		all mineral and synthetic oils – phosphate ester optional / phosphoric acid ester optional	
Display		LED	
Cleanliness		ISO MTD – particle size 4, 6, 14 and 21 µm	
Protection		IP 67	
Operating environment		100% relative humidity without condensing	
Battery		12 V / 1,2 Ah	
Size	Length	mm	250
	Width	mm	150
	Height	mm	240
	Weight	kg	6
Cables		2 x microbore hose 2mm / 1m with 16 x 2 mm couplings	
PC-Interface		RS 232 – fibre optic cable	
Software		PM 4000 – HIAC	

EXAMPLES FOR THE USE OF KLEENOIL MICROFILTRATION



□ 1 – 3 KLEENOIL filter rigs in use in the factory for cleaning the system from fabrication residues; □ 4 – 6 KLEENOIL 24-Volt filter rigs in practical use; □ 7 – 8 KLEENOIL 24-Volt filter rigs in permanent use; □ 9 – 10 KLEENOIL filter rigs in industrial use; □ 11 – 14 KLEENOIL By-pass filter for motor oil filtration in utility vehicles, construction machines and stationary motors □ 15 – 18 KLEENOIL By-pass filter for filtration of hydraulic oil.

Economic environmental conservation

KLEENOIL – Microfiltration

- **Extends the oil change intervals**
 - **Reduces waste oil**
 - **Minimises wear**
 - **Avoids malfunctions**
- **Reduces downtime and labour costs**

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