

MS2/F/GP6DV

- ◆ Steel Skid Frame
- ◆ Twin 9788 Super Duty **KLEENOIL**® Filter Units
- ◆ Haight 3U gear pump
- ◆ Selectable Dual Voltage 230v & 110v operated motor
- ◆ Heat overload switch
- ◆ Twin speed (Slow [half speed] and Full)
- ◆ Adjustable safety by pass valve supplied pre-set at 3bar
- ◆ Filter unit manifold
- ◆ Pressure gauge and sampling point.
- ◆ Electrical Control Box
- ◆ 9"MP Filter Housing with 1 micron Schroeder Element.
- ◆ 2 x 3 metre suction and return lines (Suction line is supplied as 2 x 1.5metre).
- ◆ Warranty 12 months on all parts. Full instruction manual and parts listing.
- ◆ All Rigs are built to order and are normally available within 5 to 10 working days. UK Manufactured.



Standard Unit:

L: 860mm W: 500mm H: 430mm

Weight: 64kg

The filter rig can be supplied with a steel or plastic bund and can also be mounted on castor wheels or a sturdy 4 wheeled trolley
Units can be designed to customer specifications e.g. upright twin wheel trolley, wall mounted, service van etc.

Please Note:

Due to the high viscosity of gear oils above 420cst @ 40°C we do not advise using Quick Release Couplings on the suction and return lines as these will reduce the flow rate and cause higher back pressure.

Photographs are for example only the actual product may differ slightly in design.



Filtration Unit

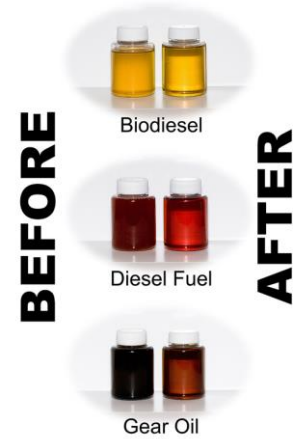
Steel skid frame with twin super duty **KLEENOIL** filter housings fitted with either 1888H (3 micron) **particle & water** removal filter cartridges or 2088PP6 (5 micron) polypropylene **particle** removal filter cartridges, a medium pressure 9" filter housing with 1 micron Schroeder element & 'pop up' dirt alarm, a Haight 3U gear pump operated by a twin speed selective 230v/ 110v control box..

The electrical control box consists of a selectable dual voltage input of 240v (blue cable) or 110v (yellow cable) selected by a voltage selector switch, running indicator light and also a 2 speed control (slow/fast). On slow speed the light is constant and on fast speed the light flashes. This dual speed will enable the filters to cope with high viscosity oils at low temperatures to maintain filtration at slower speed. With warmer temperatures the higher speed can be selected which can also be used for lower viscosity oils making this a very versatile unit for filtering a large range of oils from very light viscosity diesel up to 680 cst gear oils.

An adjustable safety by pass valve and pressure gauge are fitted as standard and the unit is also supplied with 2 x 1.5metre suction line and a 3m return line, all set up and ready to use. The twin unit rig will process approx. 360 litres of 220 viscosity gear oil per hour and approx. 180 litres per hour of 320 /460 viscosity gear oil, and 600-700 litres per hour of 32 viscosity oil (all flow rates will vary on temperature). We advise using the short suction line on the higher viscosity oils.

Optional extras:

- ◆ Steel bund
- ◆ Plastic Bund
- ◆ Safety float switch.
- ◆ 5" Magnetic pre-filter.
- ◆ Castor wheels (for the steel bund or for the skid frame)
- ◆ Longer hose assemblies
- ◆ Trolley
- ◆ Suction and return line steel tube lances
- ◆ Sampling tubes



OIL FILTRATION EVALUATION TEST.

Testing of filtration on **USED** Wind Turbine Gear Oil Shell Omala S4 GX 220 Advanced Synthetic Industrial Gear Oil
The used oil was very kindly supplied to us by Aeolus Power (Wind Energy) Ltd based in Gloucestershire BS35 4JJ , specialist suppliers and installers of wind turbines, www.aeoluspower-windenergy.co.uk

From the containers of USED oil supplied 6 were randomly selected and thoroughly mixed in a clean 160 litre holding drum and a representative sample taken and sent to the oil laboratory for analysis. The report showed the particle count to be **ISO 23/19/15**
{Particle count results are used to derive the ISO cleanliness level. ISO 4406:99 reporting structure gives the cleanliness as a three-digit value (18/16/13). It is also occasionally acceptable to report the cleanliness as a two-digit value (16/13). These digits correspond to the number of particles detected at the >4, >6, >14 micron levels for the three-digit code and the >6, >14 micron levels for the two-digit codes.}

Shell Omala S4 GX 220 Data Sheet lists a Viscosity of 230 cSt @ 40°C and 30 cSt @ 100°C. Used oil volume of 120 litres.

Temperature during filtration 15°C (viscosity 936cSt)
The flow rate was measured at 6 litres per minute (360 per hour) so the total volume of oil being recirculated within the drum would need to pass through the filtration unit 4 times to complete 1 full pass (kidney looping principal).

Time Calculation: $120 \times 4 = 480 \div 360 = 1.3$ hours
A sample was taken at the end of each full pass and 5 full passes were completed making a total of 6.5 hours filtration. Each sample was analysed for the ISO particle count.

The final particle count on this trial was **ISO 16/14/11.**
Particles at 4 micron were reduced from 45,179 (ISO 23) to 548 (ISO 16) a reduction of **98.8%**
Particles at 6 micron were reduced from 4,401(ISO 19) to 160 (ISO 14) a reduction of **96.4%**
Particles at 14 micron were reduced from 201(ISO 11) to 17 (ISO 11) a reduction of **91.5%**

More Than (p/ml)	Up To and Including (p/ml)	ISO Code
80,000	160,000	24
40,000	80,000	23
20,000	40,000	22
10,000	20,000	21
5,000	10,000	20
2,500	5,000	19
1,300	2,500	18
640	1,300	17
320	640	16
160	320	15
80	160	14
40	80	13
20	40	12
10	20	11
5	10	10
2.5	5	9
1.3	2.5	8

Faster filtration can easily be achieved by transferring from one container to another and repeating the process as all the oil would go through the unit in one full pass.

A sample of NEW oil (Enduratex 220 equivalent to Shell Omala S4 GX 220) was also analysed to identify the NEW oil cleanliness level and this had a reading of 20/18/14. According to Wind Turbine documentation the cleanliness level for NEW oil should be ISO 16/14/11. The analysis report of new oil and also before and after filtration also showed that there was no adverse effect on the additive levels.

Table 1. Required Oil Cleanliness for Wind Turbine Gearboxes

Source of Oil Sample	Required Cleanliness per ISO 4406:99
From new oil before adding to gearbox	16/14/11
From gearbox after factory testing	17/15/12
From gearbox during service	18/16/13

Potential useful life extension of gears based on improving the lubricant cleanliness from the initial to the final cleanliness codes.

Final ⇒	*/20/17	*/19/16	*/18/15	*/17/14	*/16/13	*/15/12	*/14/11
Initial ↓							
*/26/23	X 2.5	X 3	X 3.5	X 4	X 5	X 6.5	X 7
*/24/21	X 1.5	X 2	X 2.5	X 3	X 4	X 5	X 6
*/22/19	X 1.1	X 1.3	X 1.7	X 2	X 2.5	X 3	X 3.5
*/20/17	--	X 1.05	X 1.3	X 1.4	X 1.7	X 2	X 2.5
*/19/16	--	--	X 1.1	X 1.3	X 1.5	X 1.7	X 2

Benefits of filtration of NEW and USED Gear Oils

- ◆ Improved gear and bearing lubrication
- ◆ Minimal to non-existent wear metals in the oil based on the oil analysis reports
- ◆ Particle count and analytical ferrography are now realistic options for accurate predictive and proactive maintenance.
- ◆ Gear oil life is extended, thereby reducing disposal costs and environmental impact/waste oil generation.
- ◆ Reduced NEW oil costs by filtering used oils for re-use.
- ◆ Extended gearbox life by reducing wear.
- ◆ Contamination-related downtime is eliminated.
- ◆ Maintenance intervals could also be extended.

Cost analysis and savings based on hiring a filter rig:

Shell Omala S4 GX220 @ £7.80 per litre ex VAT (based on the lowest internet quote for a 209 litre drum) 209 litres @ £7.80 = **£1630.30**

Hire of filtration unit for 1 week: **£180.00**

2 x 1888H Filter cartridges @ £26.00 each = **£52.00**

1 x 1 Micron Schroeder element at **£42.60**

2 x Oil Analysis @ £25.00 = **£50.00**

Carriage (out & return) **£120.00**

TOTAL: **£444.60**

Cost per litre: £2.13



Filter larger amounts and SAVE even more as a set of filter cartridges will process around 2000 litres giving a cost of £0.22p per litre.

If you do not have the facilities, time or manpower then consider sending your oil to FA-ST or we will collect, filter and return the oil with full analysis of before and after filtration. Please contact us for pricing and turnaround times. (Based on an initial oil analysis of the used oil, terms and conditions apply)