

Transorfilter

Insulating oil reconditioning unit

TF 6000 L/h



TRANSORFILTER

www.transorfilter.se

Sweden

Transorfilter TF 6000 L/h, Features

*Highly effective self-contained unit for reconditioning of insulating oil in power transformers and other electrical equipment.
Based on 60 years of experience.*

Transorfilter insulating oil reconditioning unit, TF 6000 L/h

- Transorfilter reconditioning units give a dielectric strength that satisfies very high demands.
- PLC controlled unit with 7" HMI display and 4 different operational programs.
- High-capacity indirect electrical oil heater with low thermal flux 1.0 W/cm².
- Thermostat-controlled heating effect of max. 148kW (74kW as standard).
- Vacuum degasser with a large evaporation area and a single stage vacuum pump system.
- Variable degassing capacity between 2400 - 6000 liter/hour.
- Over-heating protection, oil level switches and automatic foam control for safe oil handling.
- Pressure sensors, flow sensors and flow meter with total count. (PPM moisture sensor optional.)
- Filter vessel with a fine filtration filter cartridge that can easily be exchanged.
- Automatic inlet and outlet valves for a safe oil handling.
- The oil treatment unit is self-contained needing only electrical supply.
- Air cooled oil pump and vacuum pump. No extra cooling system or water supply needed.
- All parts are easily accessible thus improving the reliability of service.
- TF 6000 L/h units are available as stationary chassis with fork lift pockets as standard.
- All TF units can be delivered in a 10-foot storage container for easy transportation and storage. (Mobile on site or road-worthy trailer on special request.)



TF 6000 in 10-foot container version.



TF 6000 chassis standard version.

Transorfilter TF 6000 L/h, Description

Description

The TF 6000 L/h reconditioning unit is built in a steel chassis with a heating module, a vacuum degasser and a fine filtration vessel. The oil is drawn into the system, using the vacuum pump, and is first heated then dehydrated and degassed and finally filtered before exiting the system.

The heater is built to have a high through-flow to minimize flow resistance. Also, the heating of oil is done carefully to make sure there are no hot spots that can cause cracking of the oil. This is possible thanks to heating elements with a low thermal flux of 1 W/cm² and baffles inside the heater that controls the flow.

The vacuum degasser is built to have a large surface area. The incoming oil is spread evenly in a thin film over the Raschig ring packed column where the dehydration and degassing take place. The oil and foam level inside the vacuum degasser is automatically controlled using mechanic and electronic sensors.

The filtration consists of two parts. A coarse filter is situated at the inlet, before the heater, to remove larger particles, typically 150-300µm. After vacuum treatment a fine filter is situated. This is a filter vessel with a replaceable 20" filter cartridge that filters the smallest particles. The filter cartridge has a $\beta_x(3) \geq 2000$ based on ISO 16889 with rating 07/04/01.

Life time expectancy of the filter cartridge depend on the amount of contamination and particles from the transformer oil. If new clean oil is treated the life expectancy will be very long compared to if old heavily contaminated oil is treated. An electronic pressure drop indicator tells the operator via the HMI panel when it is time to change the filter cartridge.

The piping and vessels of the TF 6000 L/h must be filled up with oil before usage. Also, there is a possibility to drain the system after usage. This is done using the vacuum pump and oil pump. Choose desired operational program in the HMI display. The TF 6000 system is tested with oil in factory and drained before delivery to customer.

TF 6000 L/h single stage vacuum unit

The Transorfilter TF 6000 L/h oil treatment unit is a single stage unit. The oil is treated in a single vacuum degasser with a single vacuum pump with automatic foam and oil level control.

The filter principle in combination with a vacuum degasser has for many years been the best equipment obtainable for removing solids and moisture from insulating oil. Larger transformers with high voltage have high requirements on the oil quality. Transorfilter meet these high demands.

Operating modes

The TF 6000 L/h unit comes with different pre-programmed operational modes. There are 4 different programs to choose between in the 7" HMI touch display.

1. Normal operation (*Heating, Degassing, Filtration*). Adjustable flow rate 2400 - 6000 L/h.
2. Filling system with oil.
3. Emptying oil from system.
4. Pump station (*Heating, Filtration*). Adjustable flow rate, max 9000 L/h.

Transorfilter TF 6000 L/h, Operation

Principle of operation

The principal flow diagram below shows a TF 6000 L/h single-stage oil reconditioning unit. The oil is drawn in through the inlet valve, using the vacuum inside the vacuum degasser, created by the rotary vane vacuum pump. Therefore, there is no need for an oil inlet pump. The oil passes a strainer that remove large particles, an electric oil heater that heat up the oil to approx. 60-70°C before entering the vacuum degasser with its outlet oil pump and flow/foam regulating system. Finally, the oil is filtered down to a few microns and comes out fully cleaned through the outlet valve.

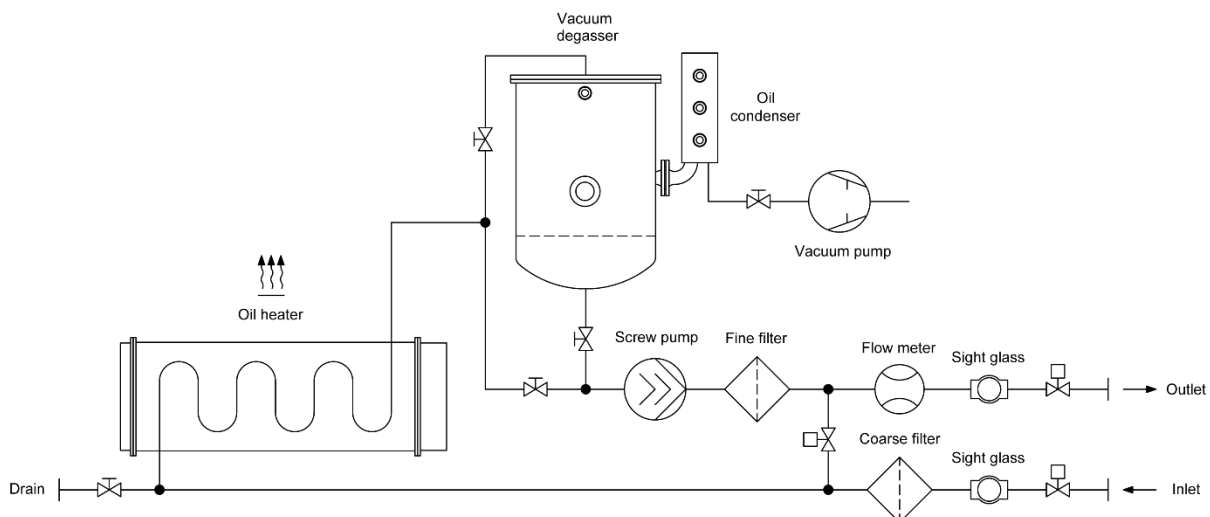
A built-in flow meter with total count tells the operator how much oil that has been treated and what the treatment flow rate is at the moment. The treatment flow-rate is adjustable between 2400 - 6000 L/h.

The oil temperature is controlled by a thermostat, and a flow sensor is installed to make sure there is oil in circulation when the heater is activated.

The rotary vane type air cooled vacuum pump keeps the pressure in the vacuum degasser >1 mbar during operation to make sure water is removed, but lighter aromatics and additives stays in the oil.

The moisture content of the incoming transformer oil can be monitored and measured by an optional PPM transmitter added to the TF 6000 L/h equipment upon customer request.

The outlet oil pump is a magnetically coupled air cooled screw pump used to transport the degassed oil from the vacuum degasser and out of the TF 6000 L/h unit, back to the transformer or storage tank.



Schematic flow diagram of a TF 6000 L/h insulating oil treatment unit.

Capacities and basic forms

The Transorfilter TF 6000 L/h oil reconditioning unit has an adjustable heating, degassing and filtration capacity of 2400 - 6000 liter/hour. This is the normal operational mode.

Capacity of oil pump in pump station mode is max. 9000 liter/hour. Settings are made in the 7" HMI display and the flow is controlled by PLC and frequency converter connected to oil pump.

TF 6000 L/h can be delivered as either stationary or mobile unit. On special request, some units, depending on weight and options can be assembled on a road worthy trailer to be towed after a suitable car at 80km/h. Special adaption to trailer or national traffic regulations is done on request.

The standard voltage is 400 volt, 3-phase, 50 Hz. Other voltage specifications on request.

Transorfilter TF 6000 L/h, Technical Data

Performance after a single passage through the system. (Several passes give better results.)

	Starting condition	After one single pass
Water content (ppm)	<50ppm	<5ppm
Gas content (% by volume)	<10%	<0,2%
Breakdown voltage (kV/2,5mm)	30	>65
Particles	N/A	$\beta_{x(3)} \geq 2000$ ISO16889, code 07/04/01

Other specific TF 6000 L/h technical data:

Hoses	
Inlet hose:	1 pcs, L=10 m incl. quick connections
Outlet hose:	1 pcs, L=10 m incl. quick connections
Suction nozzle for oil barrels / IBC:	Yes, 1 pcs included with quick connection

Heating system	
Total heating capacity:	0 - 148kW (Standard 74kW)
Thermostat controlled heating:	0 - 90°C (Factory setting 65 - 70°C)
Low thermal flux:	1.0 W/cm ²
Temp. increase / passing:	Approx. 20 - 40°C / pass

Filtration system	
Coarse filter:	1 pcs, mesh type for rough filtration
Fine filter:	1 pcs (with replaceable cartridge)
Filtration capacity, fine filter:	ISO16889, code 07/04/01, down to ~1 micron

Circulation system	
Outlet oil pump:	1 pcs, screw type, magnetic coupled
Degassing / Filtration capacity:	2400 - 6000 L/h (40 -100 liter/minute)
Pump station capacity:	9000 L/h (150 liter/minute)

Vacuum pump / Single stage degasser	
Rotary vane vacuum pump:	1 pcs (Optional with extra vacuum pump)
Vacuum pump flow capacity:	300 m ³ /h
Vacuum capacity:	<1mbar
Pressure in degassing chamber:	>1mbar (during reconditioning)
Automatic foam control:	Yes
Automatic oil level control:	Yes
Safety level control switches:	Yes

Power connection	
Standard voltage and frequency:	3x400V, 50Hz (Other specifications on request.)

Operating instructions and manual	
Included with the unit:	Yes (Printed and digital copy)
Language:	English

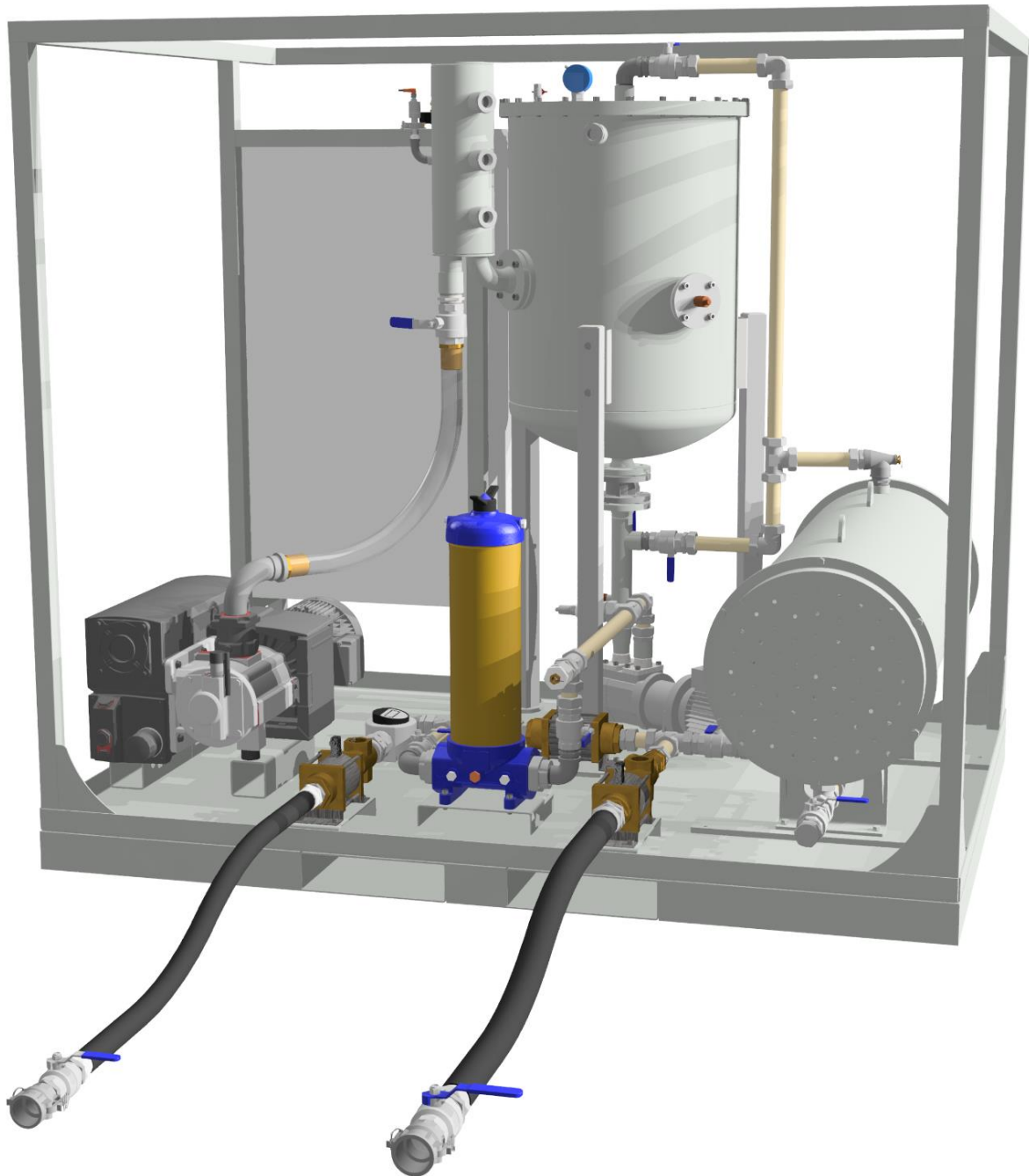
Other information	
TF 6000 L/h is tested in factory with transformer oil before delivery. Small quantities of oil may be left in the system at delivery.	Type of oil: Nynäs Nytro 10XN

Transorfilter TF 6000 L/h, Measurements

Other technical data:

Measurements TF 6000 L/h unit	Chassis type	Container type, 10ft storage
Length:	2300 mm	3000 mm (Container)
Width:	1700 mm	2450 mm (Container)
Height:	2200 mm	2600 mm (Container)
Total weight:	Approx. 2000 kg	Approx. 3000 kg (incl. container)

Subject to change without prior notice.



Transorfilter single stage TF 6000 L/h insulating oil reconditioning unit.

