



# **FILOIL® 12 000** Transformer oil treatment plant

# FILOIL 12 000 transformer oil treatment plant

The necessity for transformer oil dehydration and degassing is known for a long time. Transformer oil is used in power equipment where it provides cooling and insulation protection. Over time aggregated moisture, gasses and solid particles can seriously affect these properties. To remove moisture, gasses, and solid particles oil treatment equipment needs to be used. Oil treatment equipment treats oil in the following steps.

## Description of oil treatment process

Oil is heated by electrical heaters with surface efficiency below 1.5 W/cm, with indirect heating to prevent local overheating. Oil at the outlet is filtered by a fine, up to, 0.5-micron filter to filter out solid particles before returning the oil back to the transformer. Equipment is fully automatic, optionally controlled by PLC logic and interfaced with a SCADA system. Numerous safety features are introduced throughout the plant to ensure the safety of the equipment as well as the operating personal. Aeration valves, overheating protection, and automatic level switches guarantee the safety of the equipment as well as its ability to identify a possible risk and to power down to prevent any accidents.

All oil treatment plants possess a positive displacement rotary inlet pump. The outlet pump is a centrifugal closed coupled high suction pump. For dehydration and degassing the rotary vane, a vacuum pump and vacuum booster roots pump are used. Vacuum chamber houses a variable amount of coalescer filters to achieve most efficient treatment of oil. All oil treatment plants have automatic variable oil flow control to maximize user comfort during operation. Vacuum breaking valves before and after the vacuum chamber ensure the vacuum side and the pressure side of the oil treatment plant are completely separated.

#### Features

- Electrical heaters with surface efficiency below 1.5 W/cm2, with indirect heating to prevent local overheating
- Fully automatic operation of the FILOIL units optionally controlled by PLC and operated via a SCADA system on the electrical cabinet
- High vacuum double or single stage coalescer based dehydration and degasification section
- Double or single stage vacuum system to ensure high vacuum in the vacuum chamber
- Filter rated up to 0.5 microns prevents particles from entering back into the transformer
- Oil catch pan to prevent accidental spillage, with automatic shutdown control
- All electrical wiring across the FILOIL units conforms to the highest European standards and consists only of high-quality components to ensure the reliability of the unit
- · Variable flow rate of oil is an integral part of the FILOIL plant design allowing the users full flexibility during oil treatment
- Optional digital oil flow meter directly integrated into SCADA
- Optional touch panel for easy SCADA operation placed on the electrical cabinet
- Possibility of full manual control
- Integrated anti clog filter system
- Bypass for the possibility to only use heating or filtering capabilities of the plant
- Highly effective foam sensor to prevent extensive foaming in the vacuum chamber
- · Possibility of online moisture measurement probes on inlet and outlet integrated into SCADA
- Possibility of remotely access to the unit via integrated GSM modem
- Commissioning and FAT on location
- SCADA system localized to most popular languages
- Full set of documentation also in electronic form available for download

### Extra options

- Standard 20-foot sea fright container
- Road worthy trailer modified to house FilOil unit
- Set of spare parts for 2 (up to 10) years of operation
- Commissioning on site
- Supervision for operation on an energized transformer
- Extra vacuum system for transformer evacuation
- Extra vacuum system for parallel transformer evacuation
- 2 flexible houses with flange or quick coupling connection
- Power cable with cam lock system with variable length
- Remote access module
- Online moisture measurement

#### Performance

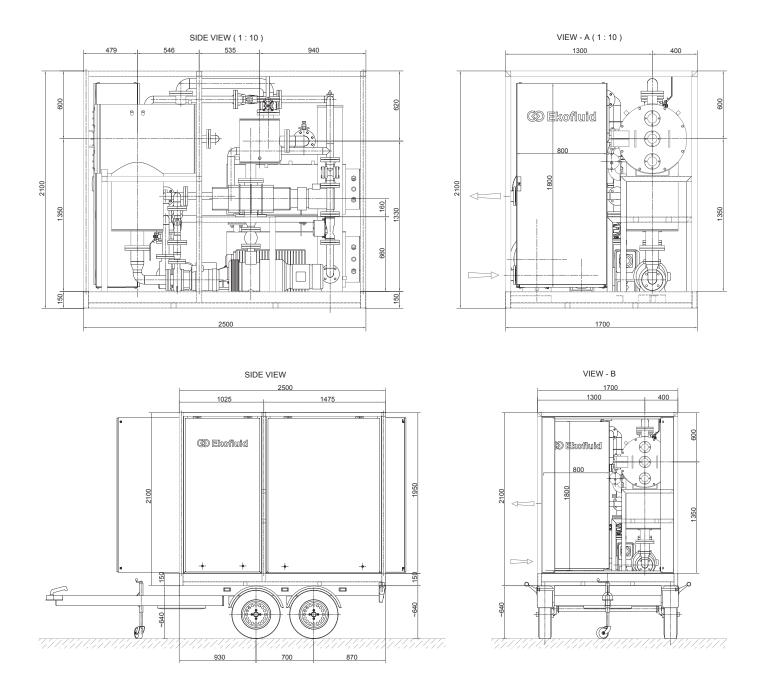
FILOIL double stage high vacuum equipment is used to decrease total water content (ppm) and gasses present in transformer oil. Highly efficient dual stage vacuum system with vacuum chamber housing highly effective coalescer system is an ideal solution for dehydration and gas removal. Water content is decreased to less than 5 ppm according to the IEC 60814 or ASTM D1533 standards. Total gas content is reduced down to less than 0,1% according to the IEC 60567 or ASTM D2945 standard. Particulate matter is lowered to less than 99% of particles over 1.0 microns. Dielectric breakdown is improved above 60 kV. With the use of a regeneration module acidity and interfacial tension are also improved to acceptable values by the IEC 60422 standard.

| Property                        | Starting value | One pass        | Several passes  |
|---------------------------------|----------------|-----------------|-----------------|
| Humidity (ppm)                  | < 50 ppm       | <= 5 ppm        | <= 3 ppm        |
| Gas removal (%)                 | < 10%          | <0,2%           | <0,1%           |
| Particulate matter (micron)     | na             | 98% of over 0,5 | 98% of over 0,5 |
| Dielectric breakdown (kV/2,5mm) | 30             | >=65            | >=85            |

# Technical data

| DimensionsLengthmm2500Widthmm1700Heightmm2100Wieghtkg2700Wheels dimensions*2000Widthmm2200Widthmm2200Widthmm2200Wightkg3200Oil flow min1/h2000/2500/3000Oil flow min1/h2000/2500/3000Oil flow max1/h11000/12000/13000Oil flow max1/h1000/12000/13000Oil outletDN50Oil outletDN50Piping*C50-90Tansformer vacuum outletDN80Operating temp*C50-90Fitersmicron150Inel coarsemicron150Fine micron0,520Calescersquantity20El. Heater stepsquantity63-06KW150-20020MotorsKW24          | Property                  | Unit     | 12000             |
|---|---------------------------|----------|-------------------|
| Vidthmm1700Heightmm2100Weightkg2700Wheels dimensions*Lengthmm2500Widthmm2200Heightmm2200Weightkg3200Oil fhorughput3200Oil flow manI/h2000/2500/3000Oil flow maxI/h1100/1200/13000Piping50Oil outletDN50Oil outletDN50Operating temp°C50-90Fitersmicron150Pine filtermicron150Pine filtermicron0,5Coalescersquantity20El. Heater stepsquantity3-06El. Heater stepskW150-200  | Dimensions                |          |                   |
| Heightmm2100Weightkg2700Wheels dimensions*Lengthmm2500Widthmm2200Heightmm2200Uidthkg3200Oll flow minL/h200/2500/3000Oll flow maxL/h1100/1200/13000Oll flow maxL/h1100/1200/13000Oll flow maxL/h50Oll flow maxL/h50Oll outletDN50Oll outletDN50Operating temp°C50 - 90Fitersmicron150Pin filtermicron10Fine filtermicron0,5Coalescersquantity20El. Heater stepsfuantity3 - 06El. Heater stepskW150 - 200   | Length                    | mm       | 2500              |
| Weightkg2700Wheels dimensions*2500Lengthmm2500Widthmm2200Heightmm2200Weightkg3200Oil throughput1000/2500/3000Oil flow maxl/h11000/12000/13000Oil flow maxl/h11000/12000/13000Oil flow maxl/h50Oil outletDN50Oil outletDN50Oil outletDN50Operating temp°C50 - 90Fitersmicron150Pine filtermicron0,5Fine filtermicron0,5Coalescersquantity20El. Heater stepskW150 - 200   | Width                     | mm       | 1700              |
| Wheels dimensions*   Length mm   Vidth mm   2200   Height mm   2200   Weight kg   Oil throughput   Oil flow min I/h   Oil flow max I/h   10100/12000/13000   Oil inlet DN   Oil outlet DN   Oil outlet DN   Operating temp °C   Fiters micron   Inlet coarse micron   Fine filter micron   Fine filter 0,50   Coalescers quantity   Quantity 32.00   El. Heater steps kW  | Height                    | mm       | 2100              |
| Lengthmm2500Widthmm2200Heightmm2200Wightkg3200Oil throughputOil flow minI/h2000/2500/3000Oil flow maxI/h11000/12000/13000Oil flow maxI/h11000/12000/13000PipingDN50Oil outletDN50Oil outletDN50Oil outletDN60Operating temp°C50-90Fitersmicron150Pre filtermicron0,5Coalescersquantity20El. Heater stepsquantity03-06El. Heater stepskW150-200  | Weight                    | kg       | 2700              |
| Widthmm2200Heightmm2200Weightkg3200Oil throughputOil flow minl/h2000/2500/3000Oil flow maxl/h11000/12000/13000Oil flow maxl/h11000/12000/13000PipingDN50Oil outletDN50Oil outletDN50Oil outletDN50Operating temp°C50 - 90Fitters150Inlet coarsemicron150Pre filtermicron0,5Coalescersquantity20El. Heater stepskW150 - 200  | Wheels dimensions*        |          |                   |
| Heightmm2200Weightkg3200Oil throughput01Oil flow minl/h2000/2500/3000Oil flow maxl/h11000/12000/13000PipingDN50Oil outletDN50Oil outletDN50Operating temp°C50 - 90Fiters100100Inlet coarsemicron10Fine filtermicron0,5Coalescersquantity20El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200  | Length                    | mm       | 2500              |
| Weight   kg   3200     Oil throughput   1   2000/2500/3000     Oil flow min   I/h   2000/2500/3000     Oil flow max   I/h   11000/12000/13000     Piping   DN   50     Oil outlet   DN   50     Oil outlet   DN   50     Oil outlet   DN   80     Operating temp   °C   50-90     Filters   1100   150     Inlet coarse   micron   150     Pre filter   micron   0,5     Coalescers   quantity   20     El. Heater steps   quantity   03-06     El. Heater steps   KW   150-200 | Width                     | mm       | 2200              |
| Oil throughputOil flow minI/h2000/2500/3000Oil flow maxI/h11000/12000/13000PipingDN50Oil outletDN50Oil outletDN50Oil outletDN80Operating temp°C50 - 90FittersTitleron150Inlet coarsemicron150Pre filtermicron0,5Coalescersquantity20El. Heater stepsquantity03 - 06El. Heater stepsKW150 - 200  | Height                    | mm       | 2200              |
| Oil flow minI/h2000/2500/3000Oil flow maxI/h11000/12000/13000PipingDN50Oil outletDN50Oil outletDN50Transformer vacuum outletDN80Operating temp°C50 - 90Filters150Inlet coarsemicron150Pre filtermicron0,5Goalescersquantity20El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200   | Weight                    | kg       | 3200              |
| Oil flow maxI/h11000/12000/13000PipingDN50Oil inletDN50Oil outletDN50Transformer vacuum outletDN80Operating temp°C50 - 90FiltersInlet coarsemicron150Pre filtermicron0,5Coalescersquantity20El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200  | Oil throughput            |          |                   |
| Piping   Oil inlet DN 50   Oil outlet DN 50   Transformer vacuum outlet DN 80   Operating temp °C 50 - 90   Filters  50   Inlet coarse micron 150   Pre filter micron 0,5   Coalescers quantity 20   El. Heater steps quantity 03 - 06   El. Heater steps kW 150 - 200  | Oil flow min              | l/h      | 2000/2500/3000    |
| Oil inletDN50Oil outletDN50Transformer vacuum outletDN80Operating temp°C50 - 90FittersInlet coarsemicron150Pre filtermicron10Fine filtermicron0,5Coalescersquantity20El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200   | Oil flow max              | l/h      | 11000/12000/13000 |
| Oil outletDN50Transformer vacuum outletDN80Operating temp°C50 - 90Filters50Inlet coarsemicron150Pre filtermicron10Fine filtermicron0,5Coalescersquantity20El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200  | Piping                    |          |                   |
| Transformer vacuum outletDN80Operating temp°C50 - 90Filters150Inlet coarsemicron150Pre filtermicron0,5Coalescersquantity20El. Peater stepsquantity03 - 06El. Heater stepskW150 - 200  | Oil inlet                 | DN       | 50                |
| Operating temp°C50 - 90FiltersInlet coarsemicron150Pre filtermicron10Fine filtermicron0,5Coalescersquantity20El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200   | Oil outlet                | DN       | 50                |
| Filters     Inlet coarse   micron   150     Pre filter   micron   10     Fine filter   micron   0,5     Coalescers   quantity   20     El.power supply   El.   03 - 06     El. Heater steps   kW   150 - 200  | Transformer vacuum outlet | DN       | 80                |
| Inlet coarsemicron150Pre filtermicron10Fine filtermicron0,5Coalescersquantity20El.power supplyEl. Heater stepsquantityEl. Heater stepskW150 - 200   | Operating temp            | °C       | 50 - 90           |
| Pre filtermicron10Fine filtermicron0,5Coalescersquantity20El.power supply03 - 06El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200  | Filters                   |          |                   |
| Fine filtermicron0,5Coalescersquantity20El.power supply20El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200   | Inlet coarse              | micron   | 150               |
| Coalescersquantity20El.power supply20El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200   | Pre filter                | micron   | 10                |
| El.power supply   El. Heater steps   quantity   03 - 06   El. Heater steps   kW   150 - 200   | Fine filter               | micron   | 0,5               |
| El. Heater stepsquantity03 - 06El. Heater stepskW150 - 200  | Coalescers                | quantity | 20                |
| El. Heater steps kW 150 - 200   | El.power supply           |          |                   |
|   | El. Heater steps          | quantity | 03 - 06           |
| Motors kW 24  | El. Heater steps          | kW       | 150 - 200         |
|   | Motors                    | kW       | 24                |

| Property                     | Unit   | 12000       |
|------------------------------|--------|-------------|
| Vacuum                       |        |             |
| Vacuum capacity              | m³/h   | 740         |
| Vacuum booster               | yes/no | yes         |
| Vacuum                       | mbar   | 0,1 - 10    |
| Oil mist separator           | yes/no | yes         |
| Second vacuum line*          |        |             |
| Vacuum capacity              | m³/h   | 1000 - 2880 |
| Vacuum booster               | yes/no | yes         |
| Vacuum                       | mbar   | 0,1 - 10    |
| Oil mist separator           | yes/no | yes         |
| Control                      |        |             |
| Manual control               | yes/no | yes         |
| Additional configuration*    |        |             |
| Interchangeable inlet/outlet |        | optional    |
| Bypass valve for pumping     |        | optional    |
| Sampling valves              |        | optional    |
| Outlet water monitoring      |        | optional    |
| Sensors*                     |        |             |
| Moisture on inlet/outlet     |        | optional    |
| Gasses on outlet             |        | optional    |
| Tan delta on outlet          |        | optional    |
| Automatic control*           |        |             |
| PLC logic                    | yes/no | yes         |
| Digital touch screen         | yes/no | yes         |
| Noise                        |        |             |
| Level                        | dB     | <75         |
|                              |        |             |



The information provided in this document is by way of example and should not be relied on for any specific application. It is intended for informational purposes only and is subject to change without notice. Information may be changed or updated without notice.

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