# ZYD-T Series Double-stage
# High Vacuum Transformer Oil Filtration Machine

## Model ZYD-T-150 (8,000 ~ 10,000 L/H)

# Technical Proposal and Component List




(The pictures are for reference only, please refer to the actual product after order and completion of production)

**Proposed by FUOOTECH Oil Filtration Group**

## ■ General Description

**FUOOTECH Series ZYD-T High Vacuum Transformer Oil Filtration Machine** is suitable for the treatment of new oil and reconditioning of used transformer oil in various sizes of transformers, shunt reactor and other oil filled equipment in power plant, power station, electric power company, power transmission equipment, transformers, industrial and mining enterprises, especially suitable for on-site installation, maintenance and purifying high level new oil, or running oil from big power transmission and distribution equipment and transformers on national main power transformation grid, which is above 110-750KV. It can shorten the oil treatment period for transformer installation and maintenance, and achieve properties of treated oil within specified limits at the rated capacity.

This machine not only provides regular oil purification works including dehydration, degassing, drying and particulate removal but also reduces acidity, sludge, other soluble oil decay products, and increase the oil's dielectric strength value (BDV value) so as to improve the physical & chemical properties comparable to new transformer oil.

## ■ Technical Parameters

1. Flow rate: Model ZYD-T-150, 8000 ~ 10000 Liters/hour controlled by VFD
2. Operation Mode: Fully automatic control (PLC + touch screen HMI included), easy to operate
3. Structure: Dual-axle mobile trailer & fully enclosure parts installed for outdoor use with an oil pan at bottom;
   Hanging hooks installed for easy lifting included.

4. Main Function:
   4.1 Dehydration, Degassing, and particles removal for transformer oil.
   4.2 Hot oil circulation and vacuum oil filling for transformer.
   4.3 Transformer vacuum extraction and vacuum drying

5. Purification performance capability after 3 ~ 5 passes filtration：
   5.1. Initial oil index:
   Gas content ≤ 10 %v/v
   Water content ≤100 ppm
   Breakdown voltage: ≥20KV
   5.2. Oil index after 3 ~ 5 passes filtration：
   Gas content: ≤0.1%v/v
   Water content: ≤ 5 ±2 ppm
   Breakdown voltage: ≥65 ~ 80 KV
   Filter accuracy: ≤1 micron
   Operating Vacuum level: ≤ 20Pa

## ■ Technical Specifications

| PARAMETERS | MODEL / UNIT | ZYD-T-150 |
|---|---|---|
| Flow Rate | L/H | **8,000 ~ 10,000 BY VFD** |
| Recommended Max. oil volume in one storage tank | Tons | **30** |
| Working Vacuum Degree | MPa | **-0.08 ～ -0.099** |
| Limit vacuum | Pa | **≤20** |
| Working Discharge Pressure | MPa | **≤ 0.4** |
| Vacuum pump capacities | M3/hr | **200 m3/h for rotary vane vacuum pump<br>1000 m3/h for boost roots vacuum pump** |
| Temperature Control Range | ℃ | **20 ～ 100** |
| Operation Temperature | ℃ | **40 ~ 65 (60 ℃ is the best), adjustable** |
| Power Supply | | **380AC, 50Hz, 3 phases, 4 wires** |
| Protection Degree | | **IP55** |
| Oil Suction Lift | m | **⩾5** |
| Oil Lift Height | m | **⩾30** |
| Working hours without Trouble | Hour | **4000** |
| Continuous Working Hours | Hour | **150** |
| Use life | Years | **20** |
| Ambient Temperature | | **-20 ～ +45℃** |
| Working Noise | dB(A) | **65 ~ 85** |
| Heating Power (adjusted available) | KW | **135** |
| Total Power | KW | **150** |
| Inlet/Outlet | mm | **Φ42** |
| Weight | Kg | **1450 KGS** |
| Dimension L*W*H | mm | **1950 * 1800*1980** |

Note: The dimension and weight will be changed with changing of technical specs.
FUOOTECH reserves the rights to any upgrading without notification.

## ■ Main System & Functions

The ZYD-T High Vacuum Type Transformer oil filtration plant is complete with oil inlet and outlet pumps for drawing oil for transformers and reactors, oil heater of adequate rating, suitable filter as required to ensure oil quality, degasified complete with vacuum pumps, etc. of adequate capacity such that throughout from the purification plant is of guaranteed purity.

The 9,000 liters/hr capacity high vacuum transformer oil filtration & purification plant is mainly consisting of following main systems & functions.

**1). Quick air pumping and high operating vacuum：** vacuum separation system is our company patent technology, this set contains double-stage vacuum pumping system for degassing chamber (also it can be used for evacuating the transformer for vacuum filling of oil in transformer at spare times), including the China famous brand or Germany brand Rotary Vane Vacuum Pump, China famous brand or Germany brand mechanical booster Roots Pump, Three-dimensional vacuum flash Separation tower.
It ensures the capability of quick air pumping and high operating vacuum degree.

**2). High Efficiency Dehydration and Degassing System:** The special three-dimensional vacuum 3D three-dimensional flashing evaporation system used in vacuum degassing chamber contain special stainless steel air-water separating tower with large area, leading to the formation of film-alike oil and stereo-evaporation; It mainly consists of special vacuum three-dimensional flash evaporator, Three-dimensional vacuum flash Separation tower、Atomizer, Thin film molecular evaporation, and flash evaporation tray so as to keep the fast and high effective degassing and dehydration results.

A sight glass is installed for visual control.

**3). Durable Vacuum Pumps & Booster Roots Pump:** equipped with durable China famous brand or Germany brand Rotary Vane Vacuum Pump, and China famous brand or Germany brand roots pump, natural air cooling, The pump body is in direct contact with the motor, compact structure, small size, low noise, stable operation, The pump body has the function of impurity self-cleaning and vacuum pump oil automatic drying, It can run without failure for a long time and has a long service life. Double-stage vacuum pumps gives a higher and faster vacuum status to separating & reducing the air content and moisture content from the oil in vacuum separating chamber.

**4). Oil Inlet & Discharge Pumps：** Use international famous brand screw type oil pump, it can withstand the stress caused by high viscosity, high pressure difference medium, ensure the normal operation of positive and negative pressure in the pumps, stable operation,

low noise, no oil leakage, no new gases to be produced, convenient maintenance, suitable for the operation under high vacuum environment, and can run without fault for a long time, to achieve the oil balance of inlet and outlet.

The pumps are controlled by a frequency converter (VFD) to adjust the flow rate.

This help to achieve the oil balance of inlet and outlet.

Flow meter is installed for inline-monitoring the oil flow rates.

**5). Multi-stage Progressive filter system：** Filter system is the core part of the transformer oil filtration machine. FUOOTECH choose the international famous brand such as UK APUDA, Germany Hydac, USA Pall, etc. so as to keep the high filtration efficiency of oil and obtains the better oil cleanliness.

The impurity filtration system is divided into three stages: coarse filter, 1st fine filter (secondary filter), and 2nd fine filter. The coarse filter is stainless steel and can be cleaned repeatedly, the fine filters is a progressive multi-level encryption form. The mesh of the filter is gradually thinner from the outside to the inside, and the filter wire is also progressively encrypted to 1 micron, so that larger particles are blocked in the outer layer, and mechanical impurities in the oil are intercepted step by step. The filter has high filtration efficiency, carrying large amount of pollution, long use life.

The filter elements are easily removable for replacement when required.

Pressure gauges display with alarm indication to indicate pressure across the filter, vent and drain with valves & other necessary accessories are mounted on the filters.

**6). High Density Oil Heating Technology：** Adopting the most advanced indirect heating technology, the heating surface load shall not exceed 1.0w /cm2, thoroughly solve the local overheating caused by common conductive heating mode, which makes the oil aging, cracking and producing harmful gas. Because of high efficiency of heater, and special design of heat pipe, make the oil in the heating pipeline has a longer residence time and to ensure that no oil flow dead point.

The total electric heating power of ZYD-T-150 is 135kW, which is divided into multiple groups and automatically controlled. Heater system has the ability to heat the oil to 60~65℃ to keep the good oil process. The temperature control range is from 0 to 100℃, and the heating element has an overheat protection system, no oil or less oil protection. The heating element is not in direct contact with the oil. There is no dead oil zone. It will not cause oil cracking and aging caused by local overheating. The outlet of heater has

temperature detection and the value is displayed on the temperature controller, operator can visually understand the temperature rise.

**7). Automatic Oil Level Control System:** This equipment adopts the photoelectric foam sensor imported from South Korea, the real-time monitoring and detection system are interoperable, and the lock control technology of the control system is used to control the liquid level in the vacuum oil purifier unit, so as to ensure that the oil does not run out. Float valves and sensors connected to PLC is adopted to control the low oil level and high oil level automatically.

Meanwhile, foam sensors and auto-defoam solenoid valve are installed for controlling any foams arising in the vacuum chamber automatically.

**8). Pressure protection device：** it is equipped with over-pressure automatic alarm and stop protection device, If the pressure of the system or the fine filter core is more than 0.4MPa, the machine can be stopped automatically, so as to effectively protect the whole machine and the filters, it can realize unattended operation

**9). Electrical interlock protection：** The equipment has the design of electrical control interlock for missing phase, wrong phase, overload protection, The vacuum pump, oil pump and heater are interlocked together, and it can be automatically locked no matter there is a problem in any part, This can avoid dry burning, oil running, leakage and other phenomena, prevent equipment damage caused by wrong operation, and ensure safe operation in any case.

**10). PLC control system with touch screen control Interface：** Effective monitoring, alarm, action control and stop protection of the equipment, so that the equipment can work automatically, safely and reliably. The equipment can be operated automatically according to specific conditions. Therefore, completely unattended and automatic operation is realized.

It has the touch screen control interface with remote monitoring and control capability. The HMI have capabilities for “One-button start and One-button Stop” automated control system, allowing for the easy and automated operation of the equipment and capable of monitoring entire process on screen including flow rate, vacuum, pressure, temperature, running hour, etc.

**11). Reliable Electrical Control System:** The unique French Schneider electrical design system, combined with the German 3UG3 phase relay protector, has a 3-in-one automatic interlock retention function to ensure the smooth start of the equipment and ensure that the oil pump and motor works well without over-load and empty pumping during normal operation of the equipment. It can automatically warn when any abnormal situation occurs, so as to achieve automatic and reliable protection of the main equipment.

Main breaker, switches, push buttons, signal lights, HMI and controllers, fuses, instruments and all other electrical auxiliary equipment are well installed.

The workmanship of all electric wiring and installation is according to the IEC standard.

**12). Flange coupling (if required):** connect the oil inlet and oil outlet by flanges, reliable sealing and convenient operation.

**13)**. **Vacuum Pumping connection**: Equipped with independent vacuum interface, It can create vacuum for transformer, the same function like vacuum pumping device.

**14). Safety Non-Return Valve:** In order to prevent for any undesired oil leakage or sudden stop of machine, a non-return valve is installed into the oil outlet line, so no oil could back-flow through oil outlet pump, keep the oil level in the tank. The use of a wafer-type stainless steel non-return valve is installed on the oil outlet pipe to prevent the oil from flowing backward and the oil pump from reversing.

**15). Flow meter:** Flow meter installed has the function of recording system cumulative flow and instantaneous flow rate. If PLC system is installed, a flow sensor will be used instead of flow meter so as to make the oil flow value can be displayed on PLC touch screen directly.

**16). Safety Protection Functions：**

- ✓ This machine has the protection of over-pressure, over-load, lack of voltage, phase error, etc.

- ✓ This machine have temperature control, the temperature can be adjusted between 0 ~ 100℃;
- ✓ This machine can automatically eliminate foam;
- ✓ This machine has high oil level, low oil level control to automatically control the oil level;
- ✓ This machine has the protection device for overheating and the heater is not damaged when the oil supply is reduced or interrupted;
- ✓ This machine has the protection of power failure, under-voltage;
- ✓ This machine has the protection of back-flow.
- ✓ This machine has the protection of stopping oil dropping to the ground by installing the oil pan and baffle.

**17). Oil sampling valve:** Suitable valve is installed at suitable place of oil outlet and provided for taking oil sample during filtration.

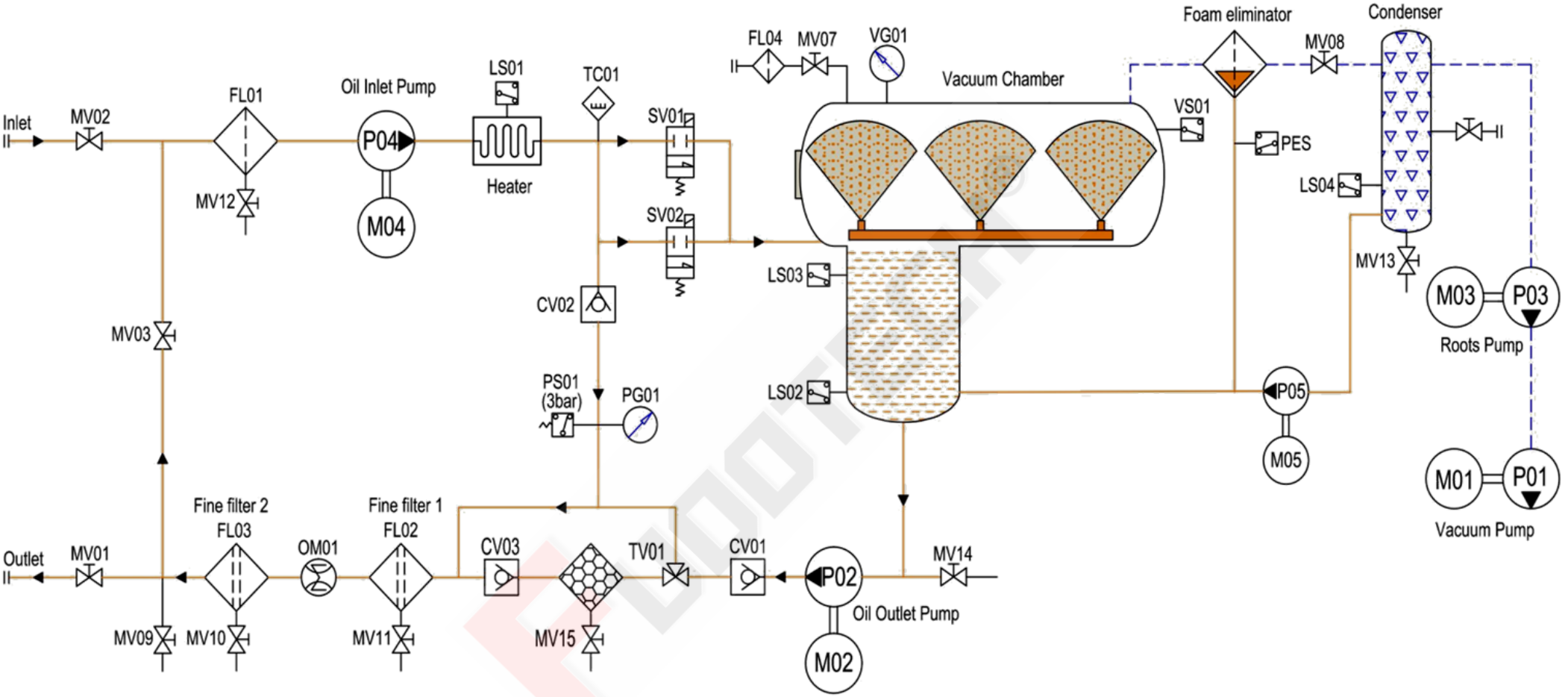
**18). Oil pan:** oil pan is structured at the bottom of frame to avoid any oil leakage from the machine and hoses due to any wrong operation of operator, so that oil can be protected and will not drop on the ground.

**19). Fully Enclosed for outdoors usage, Weather proof:**

The oil filtration machine is made in fully enclosed type, all components such as pumps, motors, filters, tanks, valves, pipelines, controls, etc.… are totally enclosed and protected by cover and heavy-duty doors enclosure and designed for lifting crane (equipped with lifting hooks). The equipment inside will be facilitated by a system of door locks installed at a perimeter of the enclosure.

➢ **Please keep reading the flow diagram and main component lists at the next pages.**

## ■ Work Flow Principle




MV01 Oil outlet valve, MV02 Oil inlet valve, MV03 Cycle valve, MV07 Air valve, MV10~MV15 Drain valve, CV01~CV03 Check valve, SV01~SV02 Solenoid valve, FL01 Pre-Filter, FL02 Fine filter 1, FL03 Fine filter 2, Fl04 Air filter, LS01~LS04 Oil level sensor, PES Foam level sensor, PS01 Pressure switch, OM01 Flow meter, VG01 Vacuum gauge, PG01 Pressure gauge, P01 Rotary vane vacuum pump, P03 Roots vacuum pump, P02 Oil outlet pump, P04 Oil inlet pump

## Main Components List & Specifications of ZYD-T-150

| Item No. | Main Components List | | Performance Description | Manufacturer, Brand | Qty | Specification |
|---|---|---|---|---|---|---|
| 1 | Vacuum Pump System | Rotary vane Vacuum Pump and its Motor | Drain up vacuum, vacuum pumping | **Leybold, Germany** | 1 Set | Nominal Capacity: 200 m3/hr, Ultimate pressure: ≤0.5 mbar, |
| | | Mechanical Booster Roots Pump and its motor | Enhance Vacuum to ultimate degree | China famous brand | 1 Set | Nominal Capacity: 1000 m3/hr Ultimate pressure: 0.05 Pa |
| 2 | Oil Pumping System | Oil Feeding Pump | Oil Feeding Pump System | **SEIM, Italy** | 1 Set | Capacity: 8 ~ 10 m3/hr |
| | | Oil Discharge Pump | Oil Discharging Pump System | **SEIM, Italy** | 1 Set | Capacity: 8 ~ 10 m3/hr |
| | | Motors for Oil Pump | Motor for Oil Discharge Pump | China Famous Brand | 2 Sets | China Famous Brand |
| | | VFD (Variable-frequency Drive) for flow control | Adjust & control oil input & output balance | China Famous Brand | 1 Set | China Famous Brand |
| 3 | Electric Components | Phase/power Relay | The Main Protector | **Schneider Electric, France** | 1 Set | Schneider Electric |
| | | Electrical Protector | The Main Protector | | | |
| | | Electrical Components (contactors, air switch etc.) | Electrical Control System | | | |
| | PLC Control System | PLC control system + touch screen panel | Making the operation automatically by PLC & touch screen | **Siemens** | 1 Set | **Siemens PLC + Touch screen** |
| 4 | Multi-stage Filter System | Primary Filter | Removing the impurity (≥50 μm), Germany Tech | **APUDA, UK** | 1 Pcs | Precision: 50 micron |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Secondary Filter | Removing the impurity (≥5 μm), Germany Tech | **APUDA, UK** | 1 Pcs | Precision: 5 micron |
| | | Fine Filter | Removing the impurity (≤1 μm), Germany Tech | **APUDA, UK** | 1 Pcs | Precision: 1 micron |
| 5 | Vacuum (Oil-water-gas) Separation System, Degassing & Dehydration System | Large area Evaporation system | The efficient of Dewatering and Degassing is 3 times quicker than that of platform | FUOOTECH Chongqing, China | 1 Set | FT-VST-0600 |
| | | UK G Technical Device | Eliminate the trace water | **FUOOTECH Chongqing, China Japan Technology** | | |
| | | Vacuum Separation Tank | Degasification（≤ 0.05%) Dewater/ dehydration (＜ 8 ppm), Germany DG—SWLT Tech | FUOOTECH Chongqing, China | | |
| 6 | Pressure Controlling System | Pressure Gauge | Inline monitoring pressure value | **ACUTEK, USA** or equivalent | 1 Set | Range: 0 ~ 1.5 MPa |
| | | Pressure Switch | Control the Pressure, Protect the Whole Machine Automatically | AIRTAC, Taiwan or equivalent | 1 Set | Range: 0 ~ 0.3 MPa |
| 7 | Vacuum Controlling System | Vacuum Gauge | Testing & Controlling Vacuum Value | **ACUTEK, USA** or equivalent | 1 Set | Range: 0 ~ -0.1 MPa |
| 8 | Heating & Thermostat system | High density Oil Heaters | Heating the Oil upto Set Temperature evenly | FUOOTECH Unique Technology | 1 Set | Total Heat Power: **135 KW** Groups: 3 or more stages |
| | | Temperature Sensor Device | Providing & monitoring the temperature through temperature sensor | China Famous Brand | 1 Set | TS-100 |
| 9 | Oil level auto-controller system | Oil Level Auto-Controlling system with Photoelectric liquid level switch & liquid indicator | Adjust the Oil Filtering system to balance oil level and inlet & outlet oil quantity, have the machine work without person or | FUOOTECH Chongqing, China | 1 Set | FT-OC-150 |

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|---|---|---|---|---|---|---|
| | | Solenoid valve for controlling oil level | run with electric on-line | China Famous Brand | 1 Set | ZCS-150 |
| 10 | Auto Defoaming System | Auto Defoaming System | Defoam & remove bubbles automatically | China Famous Brand | 1 Set | NCS-150 |
| 11 | Switches & Valves | Switches & Valves | Switches & Ball Valves | China Famous Brand | 1 set | DF-VL-50 |
| 12 | Linking, Pipeline, Chambers, Flanges and Frame | Linking, Pipeline, Chambers, Flanges and Frame | Connecting System & Main Structure | FUOOTECH Chongqing, China | 1 Set | FT-MS-100 |
| 13 | Fully enclosure and mobile trailer | Fully enclosure and mobile trailer | For weather proof and outdoor use | FUOOTECH Chongqing, China | 1 Set | FUOOTECH Chongqing, China |
| 14 | Alarm System | Alarm Warning | Alarming for any problems on filters and stop machine automatically. | China Famous Brand | 1 Set | FT-AL-150 |
| 15 | Flow Meter | Flow Meter | Online monitoring and measuring oil flow rate | China Famous Brand | 1 Set | FM-40 |

## Accessories List for free:

### 1. 1 pcs of liquid level sensor



### 2. 1 set of Sealing & Gasket



### 3. 1 set of repairing & maintenance tools



### 4. 20 meters of PVC Oil Hoses



### 5. 2 sets of operation & maintenance manuals in English version

