

ZYD-T Series Double-stage High Vacuum Transformer Oil Treatment Plant

Model ZYD-T-100 (6,000 L/H)

Technical Proposal and Component List

Proposed by FUOOTECH Oil Filtration Group



Standard Type



Mobile Trailer & Fully Enclosed Type

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

■ General Description

FUOOTECH Series ZYD-T High Vacuum Transformer Oil Treatment Machine is suitable for the treatment of new oil (as per IEC 60296) and reconditioning of used transformer oil (as per IEC 60422 for oil in-service) 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. For special application at outside field, the system also can be made in fully enclosed type and installed and operated on a trailer as optional.

■ Technical Parameters

1. Flow rate: Model ZYD-T-100, 3000 ~ 6000 Liters/hour variable with VFD
2. Operation Mode: Fully automatic control (PLC + touch screen HMI included), easy to operate
3. Structure: Movable type with casters installed on a steel frame structure
with an oil pan at bottom;
Hanging hooks/rings 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 evacuation and vacuum drying.
5. Purification performance capability after 3 ~ 5 passes filtration:

5.1. Initial oil index:

Gas content $\leq 8\%v/v$
 Water content $\leq 80\text{ ppm}$
 Breakdown voltage: $\geq 30\text{KV}$

5.2. Oil index after 3 ~ 5 passes filtration:

Gas content: $\leq 0.1\%v/v$
 Water content: $\leq 5 \pm 3\text{ ppm}$
 Breakdown voltage: $\geq 65 \sim 80\text{ KV}$
 Filter accuracy: $\leq 1\text{ micron}$
 Operating Vacuum level: $\leq 20\text{Pa}$

■ Technical Specifications

PARAMETERS		MODEL	ZYD-T-100
		UNIT	
Flow Rate		L/H	3000 ~ 6000 Liters/hour variable with VFD
Recommended Max. oil volume in one storage tank		Tons	20
Working Vacuum Degree		MPa	-0.08 ~ -0.099
Limit vacuum		Pa	≤20
Working Discharge Pressure		MPa	≤ 0.4
Vacuum pump capacities		M3/hr	100 m3/h for rotary vane vacuum pump 500 m3/h for boost roots vacuum pump
Temperature Control Range		°C	20 ~ 100
Operation Temperature		°C	40 ~ 65 (60 °C is the best), adjustable
Power Supply			380VAC, 50Hz, 3 phases, 4 wires Or as per actual request
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°C
Working Noise		dB(A)	65 ~ 85
Heating Power (adjusted available)		KW	90
Total Power		KW	100
Inlet/Outlet		mm	Φ45, Camlock quick coupling
Weight		Kg	1200 KGS
Dimension	L*W*H	mm	1650 * 1650*1930

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 treatment 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 6,000 liters/hr capacity high vacuum transformer oil filtration & treatment 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 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 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 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 oil pumps, 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, Equipped with frequency converter, 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 1.5w /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-100 is 90kW, which is divided into multiple groups and automatically controlled. Heater system has the ability to heat the oil to 60~65°C to keep the good oil process. The temperature control range is from 0 to 100°C, 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 device 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 working process on screen including flow rate, temperature, duration, history, off timer, time, etc. as default. Chargeable additional sensors such as moisture (ppm &

saturation), vacuum, pressure, and others are also available to install at client's cost.

11). Oil flow rate regulation: Oil flow rate can be adjusted according to actual needs automatically by the variable frequency converter (VFD) of the oil pump motor directly according to the scale. VFD system is installed in electrical control box and connected to PLC system, PLC touch screen displays the actual oil flow rate.

12). 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.

13). Flange coupling or Camlock quick coupling (if required): connect the oil inlet and oil outlet by flanges or camlock quick coupling, reliable sealing and convenient operation.

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

15). 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.

16). 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 displaying on PLC touch screen directly.

17). 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 by means of check valves.
- ✓ This machine has the protection of stopping oil dropping to the ground by installing the oil pan and baffle.

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

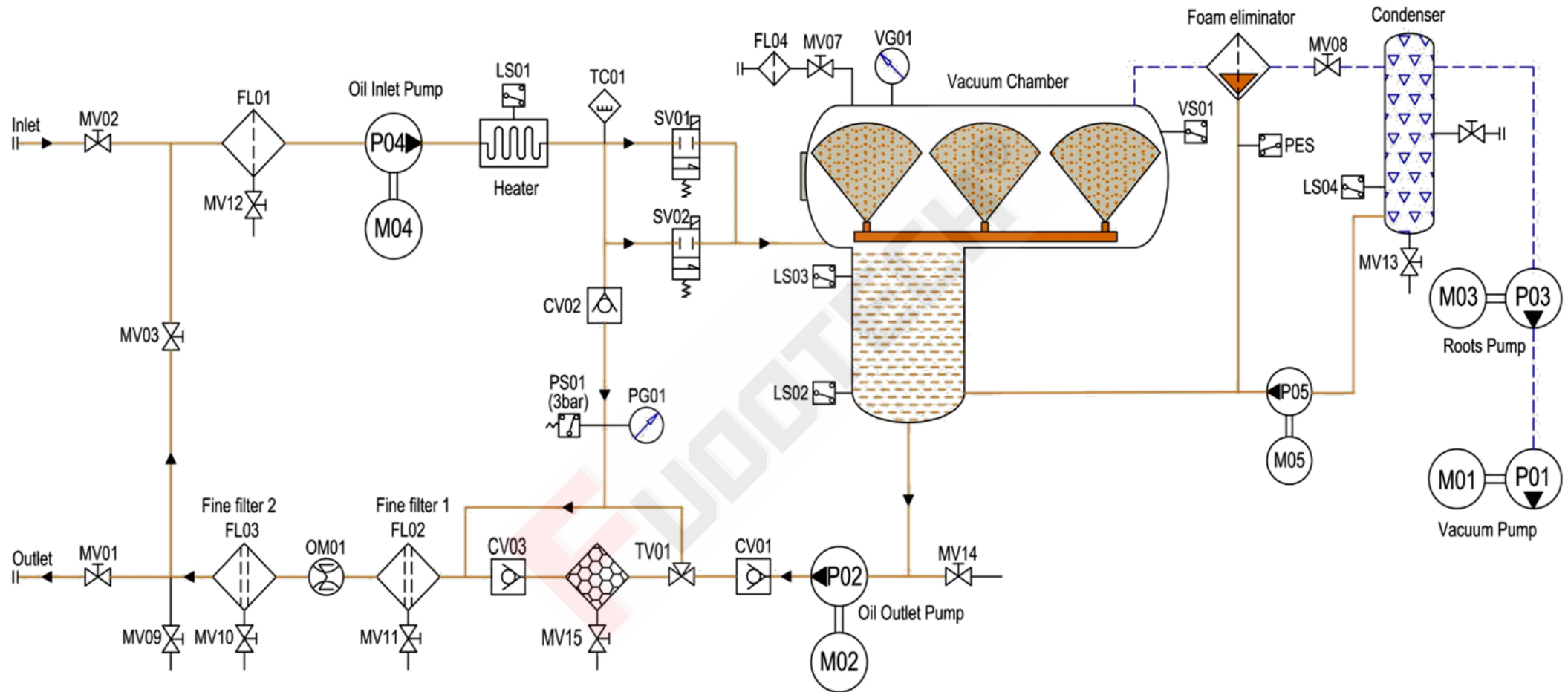
19). Oil pan: oil pan is structured at the bottom of frame to avoid any oil leakage from the machine and hoses due to any wrong operation of operator, so that oil can be protected and will not drop on the ground.

20). Mobile Trailer and Fully Enclosed for outdoors usage, Weather proof: The oil filtration machine is made in mobile type with double-axle trailer which can be mounted on motor vehicle to move to outside fields by public roads to proceed the filtration works in various environment.

It is also 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, FI04 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-100

Item No.	Main Components List		Performance Description	Manufacturer, Brand and origin	Qty	Specification
1	Vacuum Pump System	Rotary vane Vacuum Pump and its Motor	Drain up vacuum, vacuum pumping	Leybold, Germany SV Series	1 Set	Nominal Capacity: 100 m3/hr, Ultimate pressure: ≤ 0.5 mbar, Nominal motor rating: 2.2 KW
		Mechanical Booster Roots Pump and its motor	Enhance Vacuum to ultimate degree	China famous brand	1 Set	Nominal Capacity: 500 m3/hr, Ultimate pressure: 0.05 Pa, Nominal motor rating: 2.2 KW
2	Oil Pumping System for inlet and output	Oil Inlet Pump	Oil Inlet Pump System	SEIM, Italy	1 Set	Capacity: 6 m3/hr
		Oil Discharge Pump	Oil Discharging Pump System	SEIM, Italy	1 Set	Capacity: 6 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 ($\geq 50 \mu\text{m}$)	APUDA, UK	1 Pcs	Precision: 50 micron
		Fine Filter 01	Removing the impurity ($\geq 1 \mu\text{m}$)	APUDA, UK	1 Pcs	Precision: 1 micron

		Fine Filter 02	Removing the impurity ($\leq 1 \mu\text{m}$)	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 ($\leq 0.05\%$) Dewater/dehydration ($< 8 \text{ ppm}$), 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: 90 KW Groups: 2 or 3 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 run with electric on-line	FUOOTECH Chongqing, China	1 Set	FT-OC-100
		Solenoid valve for controlling oil level		China Famous Brand	1 Set	ZCS-100

10	Auto Defoaming System	Auto Defoaming System	Defoam & remove bubbles automatically	China Famous Brand	1 Set	NCS-100
11	Switches & Valves	Switches & Valves	Switches & Ball Valves	China Famous Brand	1 set	DF-VL-42
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	Alarm System	Alarm Warning	Alarming for any problems on filters and stop machine automatically.	China Famous Brand	1 Set	FT-AL-100
14	Flow Meter	Flow Meter	Online monitoring and measuring oil flow rate	China Famous Brand	1 Set	DN42 or equivalent Chongqing, China

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

