BOTUO

FW/FW55

FV/FV55

High-pressure Plunger Pump

INSTRUCTION MANUAL

Please read this manual carefully before using the pump, especially following the safety information. Please store this manual in a fixed location.

Catalogue

1、 NOTE

1.1 This manual introduces the use and maintenance of DF/DFH series high pressure pumps. Please read and understand the contents of this manual carefully before using the pump.

1.2 The Company shall not be liable for any damage caused by improper or negligent use.

1.3 Correct use and maintenance are conducive to extending the pump's service life.

1.4 Within the scope permitted by law, the company reserves the final interpretation right of this manual. If you encounter any problems, please contact us.

1.5 FW/FW55 FV/FV55 difference: FW/FW55 with gearbox, FV/FV55 without gearbox。

2、MARK

2.1Attention to safety	2.2Please read it carefully before operation	2.3Hazards beware of electric shock
		
2.4Please use a protective mask during dangerous operations	2.5Please use goggles during dangerous operations	2.6 Wear protective gloves for dangerous operation
		
2.7 Please wear insulation boots for dangerous operation		
		

3、SAFETY GUIDE

3.1 General Safety Instructions 

Incorrect use or disregard of installation and maintenance guidelines can cause serious personal injury or property damage, and personnel using high pressure pump devices must be trained and qualified on duty. For the safety of the use personnel, appropriate personal protective equipment (such as protective gloves, protective masks, goggles, insulating boots, etc.) must be used and worn during maintenance and use.

3.2 Safety rRequirements for High-pressure Components: 

a. The pump must be equipped with a safety valve.
b. High-pressure components, especially those exposed, must be protected from rain, frost and overheating.
c. The electrical parts must be waterproof and comply with relevant specifications.
d. The outlet hose must be able to meet the maximum working pressure and must be within the manufacturer's nominal pressure range. This standard applies to other pressure components.
e. To prevent the pipeline from breaking due to twisting and stretching, the connector must be fixed.
f. The pump transmission part must also strengthen safety protection (connector, safety belt, belt, pulley).

3.3 Operational Safety Guide 

The working area of the high-pressure pump must be cleaned and cannot be entered without permission. The area can be fenced off, and personnel entering the working area must be trained and qualified before entering.
Before starting, check to ensure that the water supply hose has been connected and the hose is full of water.
a. The water supply hose is well sealed and cannot leak.
b. Confirm that the switch valve between the water source and the pump has been opened, and water can flow smoothly into the pump. Adjust the pressure hose to the unloading mode to allow the air in the pump to be discharged smoothly so that the pump can start smoothly.
c. Confirm that all water supply hoses are connected and tightened.
d. There is no particularly obvious wear on the high-pressure hose, and all hose parts are intact. Before/during operation, any abnormality must be reported in time and verified by a dedicated person. In this case, the pressure in the soft pipe must be released and the high-pressure unit must be shut down.

3.4 Safety Precautions for Operation: 

a. The operator shall have the corresponding operation skills and use the equipment in strict accordance with the requirements, putting safety first.
b. The operator must have goggles, helmets, waterproof clothing, protective gloves and insulated boots, etc.
Note: Work clothes will protect against water splashing, but not well for direct or close injection, in some cases further protection is required.
c. We suggest that at least two people should operate so that they can assist each other, even during long hours of heavy work.
d. It is forbidden to enter within the working range of the jet and flow jet, and any dangerous or damaged objects caused by the impact of the high-pressure water column must be removed in this area.

e. Even at the initial test, the outgoing water must point to the working area.

f. When the high pressure pump is running, other personnel shall strictly enter the working area without safety measures.

3.5 Maintenance Safety Matters

a. Pump maintenance must be performed at the time indicated by the manufacturer.
b. Maintenance must be performed by professional personnel.
c. Pump installation and removal must be performed by a dedicated person using the correct tools to avoid damage.
d. Please use original accessories.

4、PUMP NAMEPLATE

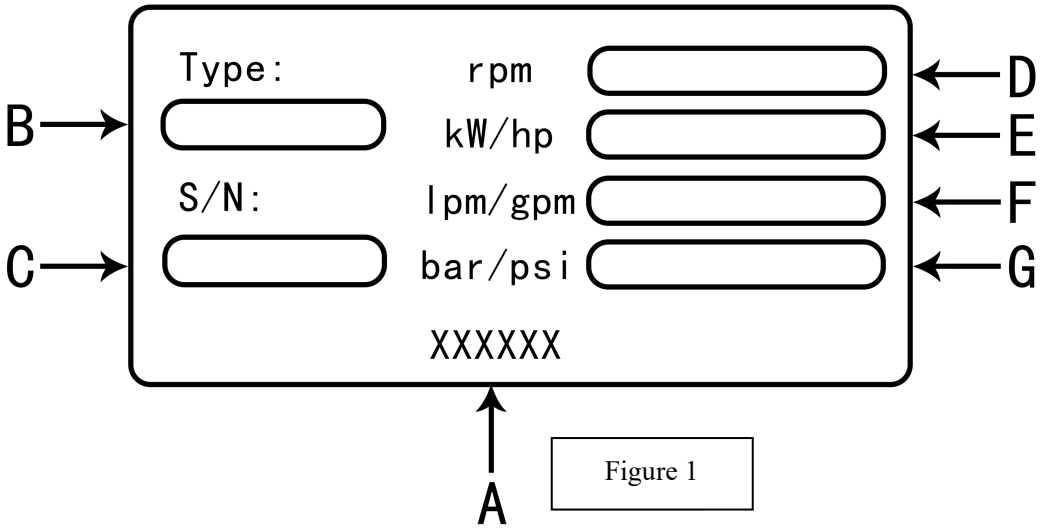


Figure 1

The nameplate shown here contains important information for safe operation, attached to each pump, as shown in Figure 1

A） Brand name
B） Product model
C） Product serial number
D） Rated speed（r.p.m）
E） Rated power（kW / hp）
F） Rated flow（Lpm / gpm）
G） Rated pressure（bar / p.s.i）

Note: When purchasing accessories, the model, serial number, and specifications of the pump should be stated

5、Technical characteristics of plunger pump

The technical characteristics of the FW piston pump are as follows:

Model	Flow Rate		Pressure			Rotate Speed（r/min）	Power		Weight
	L/min	pm	bar	psi	MPa	1:1.87 1:2.23 1:2.72	hp	kW	kg
FW32	135	35.7	300	4350	30	1500/1800/2200	110	80	239
FW36	171	45.2	240	3480	24	1500/1800/2200	111	80	239
FW40	211	55.7	210	3045	21	1500/1800/2200	120	87	239

The technical characteristics of the FW55 piston pump are as follows:

Model	Flow Rate		Pressure			Rotate Speed（r/min）	Power		Weight
	L/min	pm	bar	psi	MPa	1:1.87 1:2.23 1:2.72	hp	kW	kg
FW45	267	70.5	155	2248	15.5	1500/1800/2200	112	81	239
FW50	330	87.2	125	1813	12.5	1500/1800/2200	112	82	239
FW55	399	105.4	100	1450	10	1500/1800/2200	108	79	239

The technical characteristics of the FV piston pump are as follows:

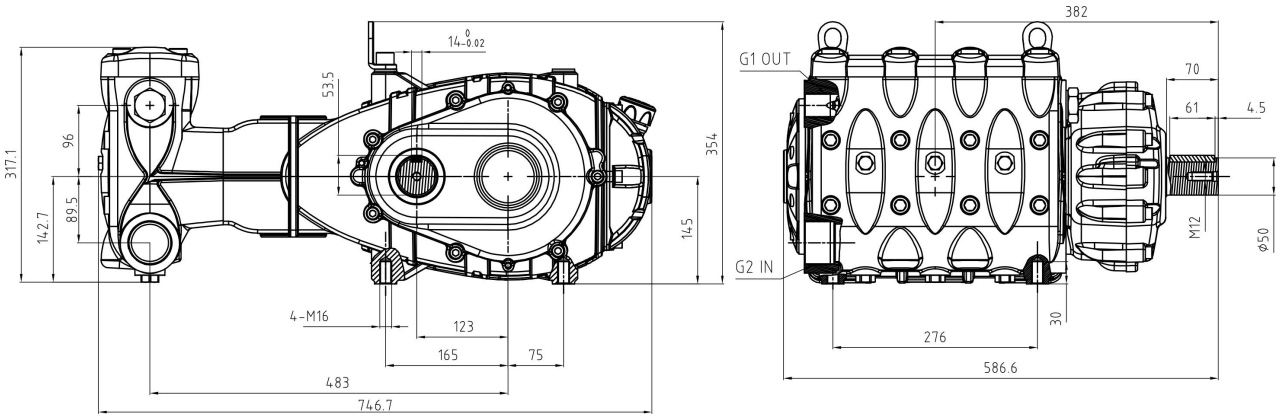
Model	Flow Rate		Pressure			Rotate Speed（r/min）	Power		Weight
	L/min	gpm	bar	psi	MPa	r/min	hp	kW	kg
FV32	168	44.9	250	3625	25	1000	113	83	209
FV36	213	56.2	200	2900	20	1000	113	83	209
FV40	263	69.5	160	2320	16	1000	113	83	209

The technical characteristics of the FV55 piston pump are as follows:

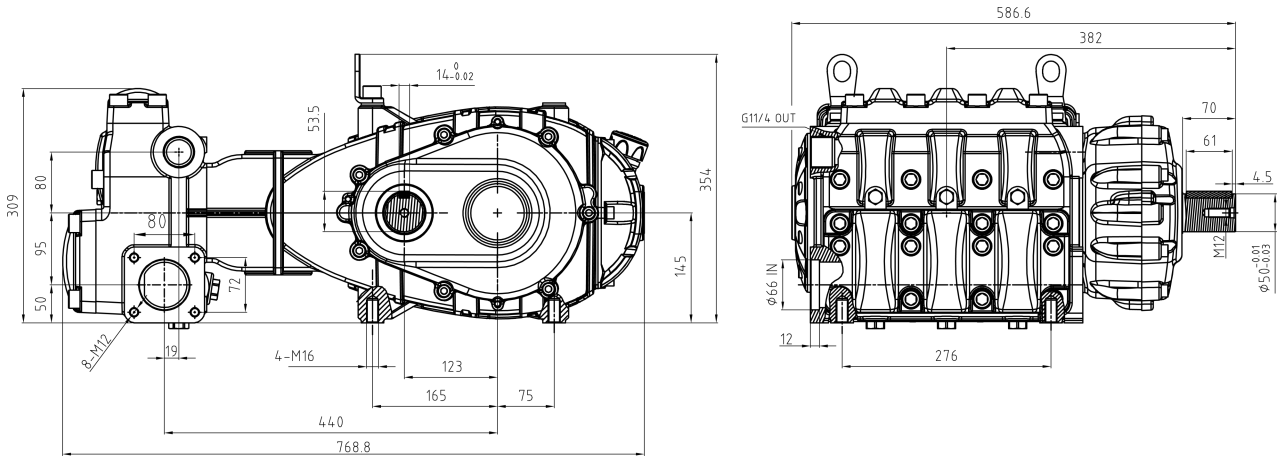
Model	Flow Rate		Pressure			Rotate Speed（r/min）	Power		Weight
	L/min	gpm	bar	psi	MPa	r/min	hp	kW	kg
FV45	333	88	100	1450	10	1000	113	83	209
FV50	330	87.2	130	1885	13	800	114	84	209
FV55	399	105.4	100	1450	10	800	108	79	209

6、Piston pump size

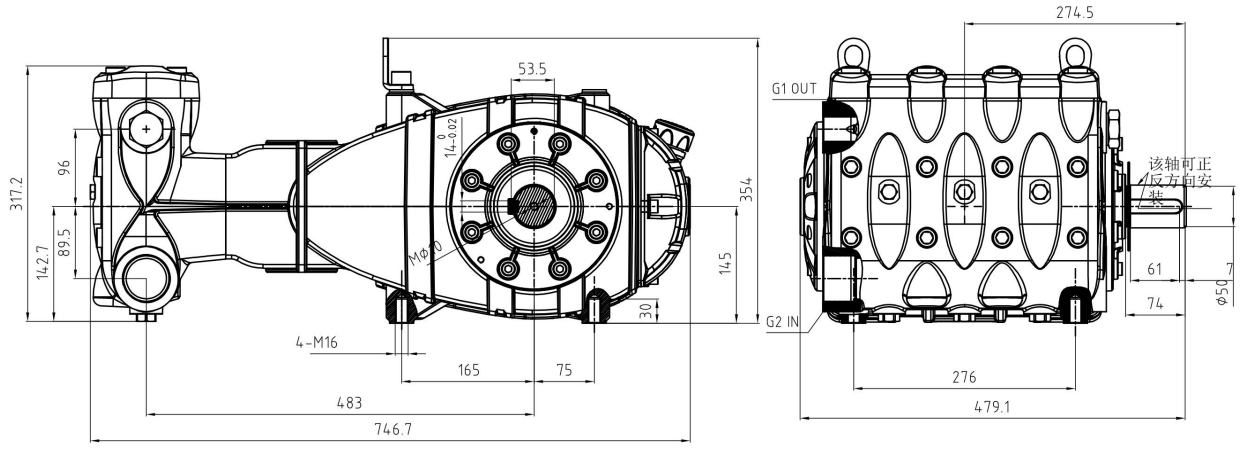
FW Please refer to the diagram for the dimensions of the series plunger pump



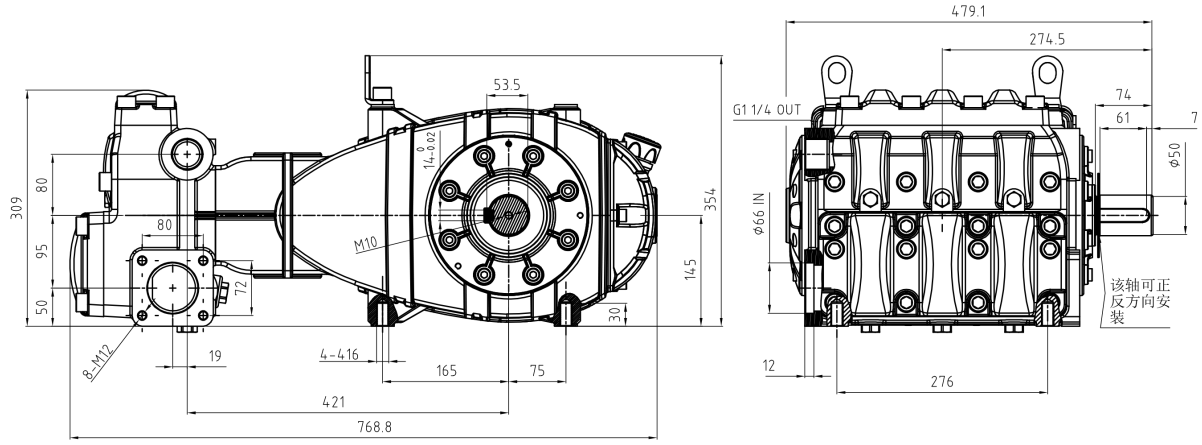
FW55 Please refer to the diagram for the dimensions of the series plunger pump



FV Please refer to the diagram for the dimensions of the series plunger pump



FV55 Please refer to the diagram for the dimensions of the series plunger pump



7、Application

The working medium of this series of high-pressure plunger pumps is **clean fresh water**, with a maximum suitable water temperature of 40 ℃. If you need to pump other medium liquids, please contact our company to obtain a suitable dedicated plunger pump.

7.1Water temperature

The maximum inlet water temperature of the pump cannot exceed 40 ℃. If it exceeds 40 ℃, please contact our company to obtain a high-temperature dedicated plunger pump.

7.2 Maximum flow and pressure

The performance parameters indicated in Chapter 5 are formulated based on the limit parameters of the water pump, and cannot exceed the rated power and pressure when used independently.

7.3 Speed and Rotation Direction

a. The speed of the pump shall not exceed the speed of the specification on the corresponding nameplate, and the minimum allowable speed is the maximum speed x0.6

b.The crankshaft rotation direction of the pump, please refer to 9.2.

7.4 Brand and type of lubricating oil

The lubricating oil that comes with the water pump is suitable for an ambient temperature range of 0 ℃ to 30 ℃. SAE 85W-90 or ISO VG 220 grade gear oil can be selected. Oil brand and model can refer to the following figure.

品牌	Agip	Castrol	Mobil 美孚	ARAL	FUCHS
型号	阿吉普爱顺 AGIP ACER 220	CASTROL HYSPIN VG 220	Mobil DTE Oil BB	Aral Degol BG 220	RENOLIN 221, RENOLIN DTA 220
品牌	Shell	KunLun 昆仑润滑油	TOTAL	长城润滑油	bp
型号	壳牌 可耐压 S2 G220	L-CKD 220	TOTAL AZOLLA AF 220	L-CKD 220	BP 安能高 Energol HLP 220

Figure 3

a. After the water pump stops and the engine oil cools down, check the oil level with an oil dipstick. You can also visually measure the oil level through the side oil level (refer to Figure 10 for the position). If necessary, add the lost lubricating oil.

b. If lubricating oil needs to be replaced, replace it when the water pump is stopped and the oil temperature is still at working temperature (pay attention to protection and avoid burns), which is beneficial for removing wear and debris in the crankcase (remove the oil drain bolt and replace the oil, refer to Figure 10 for location).

c. The FW oil volume needs to be about 8.5 liters, and the FV oil volume needs to be about 8 liters.

d. Regardless of the quality of the lubricating oil, the oil should be replaced at least once a year (due to heavy workload, it needs to be replaced after 500 hours).

e. As the room temperature changes (0-30 ℃), the viscosity of the oil material will also change, and the minimum viscosity should not be lower than 180CST.

f. Waste oil must be collected in the correct container and disposed of in accordance with laws and regulations, and cannot be discarded at will.

8、INTERFACE AND CONNECTION

The interface of FW/FVpump (as shown in Figure 4-1)

8.1 The FW/FV pump has 2 water inlets and a threaded connection is: G2". The water inlet pipeline can be used to feed water in two ways, or it can be used to feed water in one way, and when using one inlet water, one of the inlets of the pump must be blocked to prevent the pump from sucking in air.

8.2 The FW/FV pumps have 2 outlets with a threaded connection of G1".

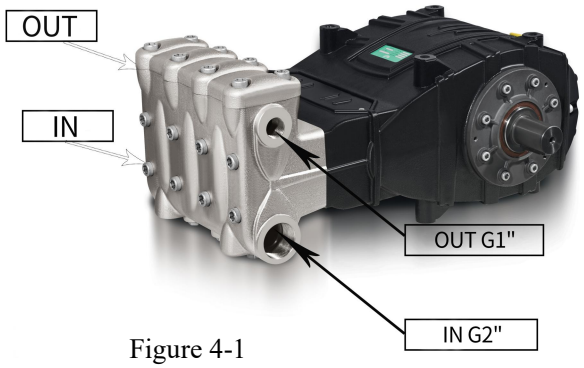


Figure 4-1

The interface of FW55/FV55 pump (as shown in Figure 4-2)

8.3 This pump has 2 inlet ports, flange connection and interface with a diameter of 6.6CM. The inlet pipeline can be used with two inlet pipes or one inlet pipe. When using one inlet pipe, one of the inlet pipes of the pump must be blocked to prevent the pump from sucking in air.

8.4 This pump has 2 water outlets, and the threaded interface is: G1-1/4"。

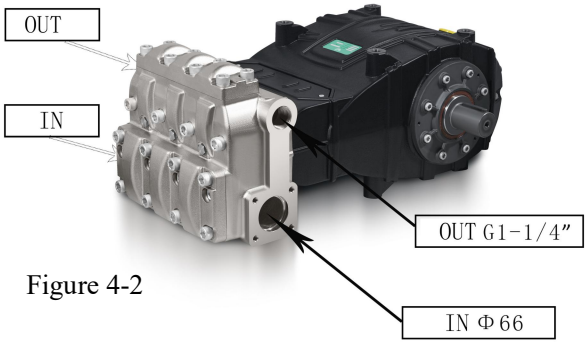


Figure 4-2

9、INSTALLATION

9.1 The pump must be installed on a flat and rigid horizontal foundation, fixed with M16 bolts. Tighten the bolt with a torque of 210 N.m. This benchmark must be sufficiently flat, rigid, and avoid deformation and misalignment caused by transmission torque.

*The lifting ring is only suitable for lifting the pump itself and is never allowed to add additional weight.

*After installation, replace the oil filling hole plug on the rear cover with the oil dipstick.

*Pump and motor are not connected by rigid coupling. The following transmission types are recommended: flexible connection, universal shaft, pulley.

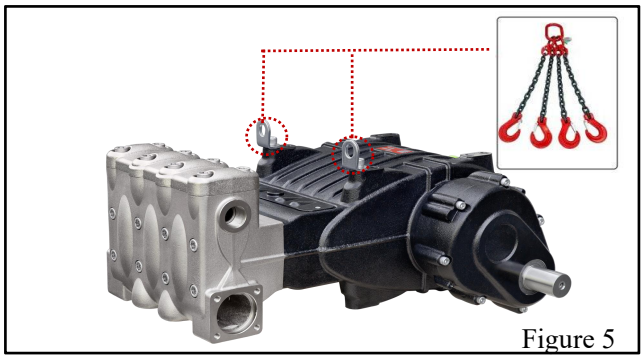
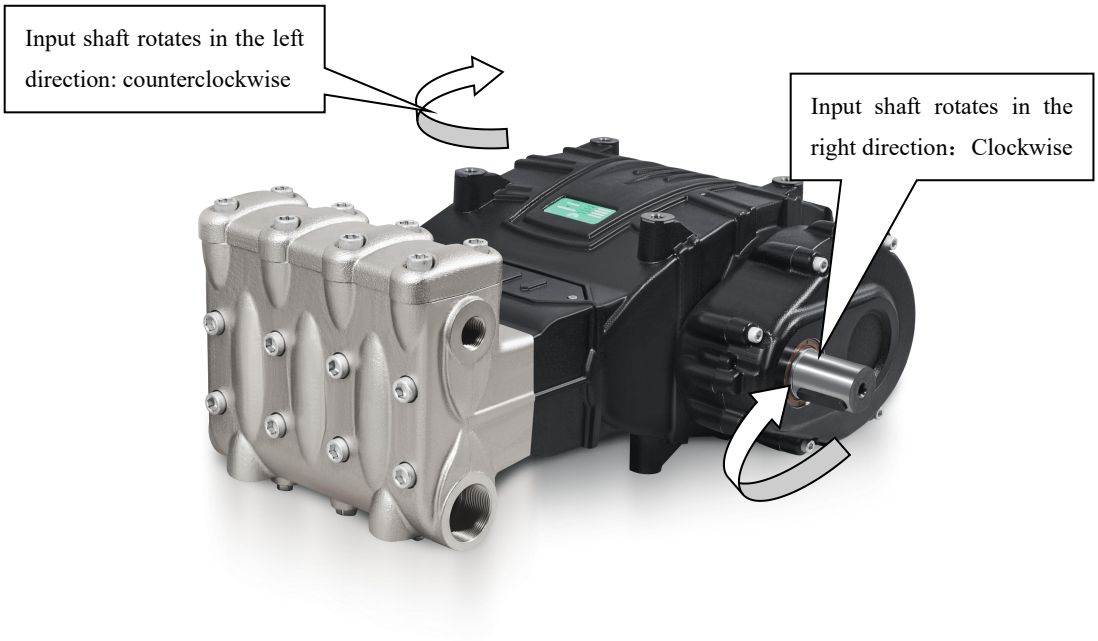


Figure 5

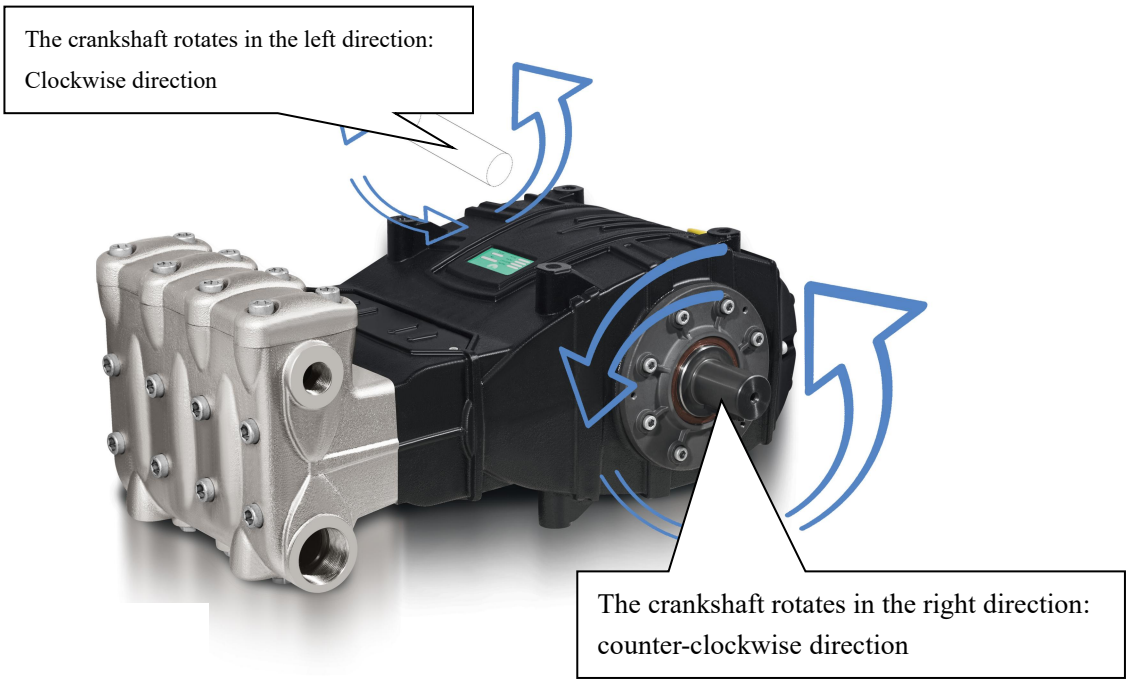
9.2 Rotation Direction

According to the correct direction of rotation indicated by the arrow, the FW/FW55 pump marks the correct direction of rotation of the pump as shown in the figure below, from the direction of the pump head, the gear crank is on the right side, which rotates in the clockwise direction; The gear crank is on the left side and rotates in a counterclockwise direction.

(Note: From the direction of the pump head, it is to distinguish which side of the crankshaft is on, and the direction of rotation refers to the view from the outstretched end of the crankshaft.)



According to the correct direction of rotation marked by the arrow, the FV/FV55 pump marks the correct direction of rotation of the pump as shown in the figure below, from the direction of the pump head, the crank shank is on the left side, which rotates in a clockwise direction; The crank shank is on the right side and rotates in a counterclockwise direction.



9.3 Change of direction of pump input shaft:

The change of pump rotation direction must be carried out by professionals according to the following steps.

a. Separate the pump head and crankcase parts, and remove the lifting ring.
b. After rotating the crankcase part 180 degrees and placing it in place, remove the rear cover and rotate it 180 degrees before installation, ensuring that the oil dipstick is facing upwards, then install the lifting ring, and finally attach the nameplate on the crankcase.
c. Connect the pump head and crankcase section.

9.4 Pipeline connection

In order to isolate the impact of pump vibration on the high-pressure system, it is recommended to use hoses at least in the initial section of water supply and drainage, and pay attention to providing support and protection for the water supply pipeline to prevent the water supply pipeline from collapsing when the pump is sucking.

9.5 Water supply requirements

This pump must be installed as a positive suction water source, that is, the water pump must be at least 1 meter below the liquid level of the water tank, or the water supply pump must be forced to supply water, and reverse suction is not allowed. To prevent cavitation and extend the service life of the pump, it is recommended to use a booster pump for water supply.

9.6 Guide for water supply system connection

The inlet connection of the pump can be operated according to the following method:
Connect the main water supply pipeline; Connected to the water tank (gravity water supply); Connect to the booster pump (booster water supply)
To ensure smooth operation of the pump, attention should be paid to the following points when connecting various water supply pipelines:

d. The inner diameter of the water supply pipe should be at least ____mm. (Refer to Figure 10 for calculation)
e. The layout of the water supply pipeline should be good to prevent the formation of air pockets.
f. Good sealing performance.
g. Prevent the emptying of the water supply pipe due to pump stoppage (backflow to the low point), even if it is partial emptying.
h. Do not use hydraulic fittings such as three-way, four-way fittings, pipe joints, rotary joints, etc., as these fittings may damage the performance of the pump.
i. Do not install cleaning nozzles.
j. Do not install some check valves.
k. Do not directly connect the return water to the water supply pipe.
l. Return water in the water tank may generate turbulence, causing air pockets in the water supply pipe. A suitable partition should be installed in the water tank.

Before connecting the water supply pipeline to the pump, ensure that the interior of the water supply pipeline is completely clean.

9.7 Water inlet connection mode of the pump and start and stop precautions

9.7.1 Connect the main water supply pipeline

The connection of the water supply pipe must be operated according to the recommended specifications:

1) The flow of the main water supply system must be twice the normal working flow of the pump, and the pressure must be 2-3bar.
2) Take all precautions described in the Water Supply System Connection Guide.

Below is a simple diagram of the pump connection to the main water supply pipe. Figure 7

A) Tap water
B) Inlet filter
C) High pressure pump
D) Pressure gauge
E) Accumulator
F) Pressure regulating valve
G) Drainage pipe
H) Nozzle
L) Main water supply pipe switch

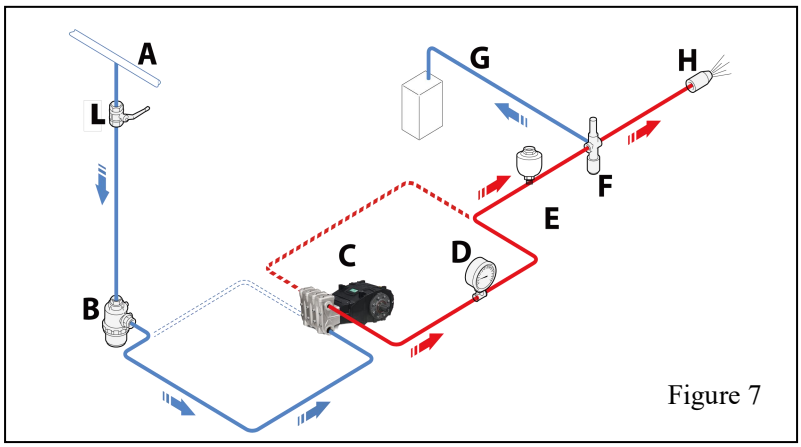


Figure 7

9.7.2 Connecting water tank (gravity water supply)

The connection must be operated according to the recommended specifications:

1) The pump must be installed below the inlet position of the water tank

2) There must be a baffle on the water tank to prevent water from splashing out, and the capacity of the water tank must be at least 10 times the rated flow rate of the pump

3) The self-priming pressure directly measured at the inlet of the pump cannot exceed 0.01 MPa, and the water temperature cannot exceed 40 ℃

4) Take all the preventive measures described in the water supply system connection guide.

The following is a simple diagram of the connection between the pump and the main water supply pipe. As shown in Figure 8

A) Water tank
B) Inlet filter
C) High pressure pump
D) Pressure gauge
E) Accumulator
F) Pressure regulating valve
G) Drainage pipe
H) Nozzle
L) Main water supply pipe switch

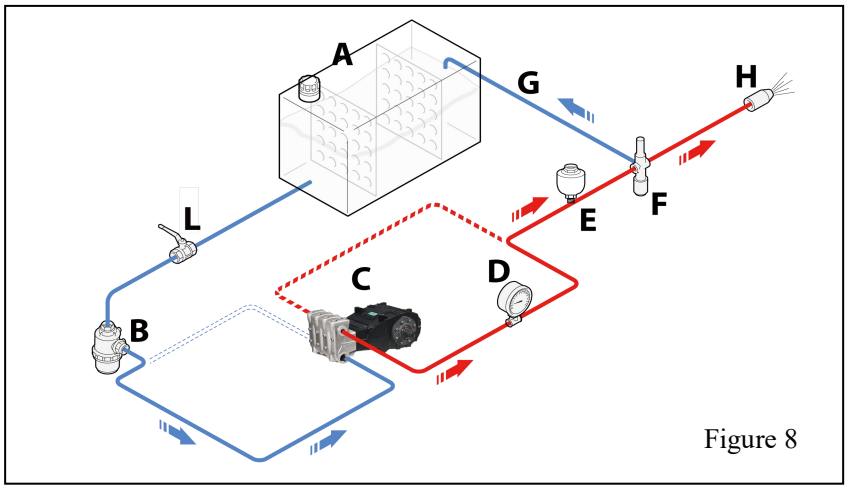


Figure 8

9.7.3 Connecting the booster pump (the booster pump for water supply)

Connections must be performed according to the recommended specifications.

9.7.3.1 The flow of booster pump must be twice the normal working flow of high pressure pump and the operating pressure is 2-3bar.

9.7.3.2 Take all precautions as described in the Water Supply System Connection Guide.

Below is a simple diagram of the pump connection to the booster pump.

Figure 9

A) water box
B) Intake filter
C) booster pump
D) high lift pump
E) pressure gage
F) accumulator
G) pressure regulating valve
H) drain-pipe
I) drain-pipe
L) spray nozzle
M) Main water supply pipe switch

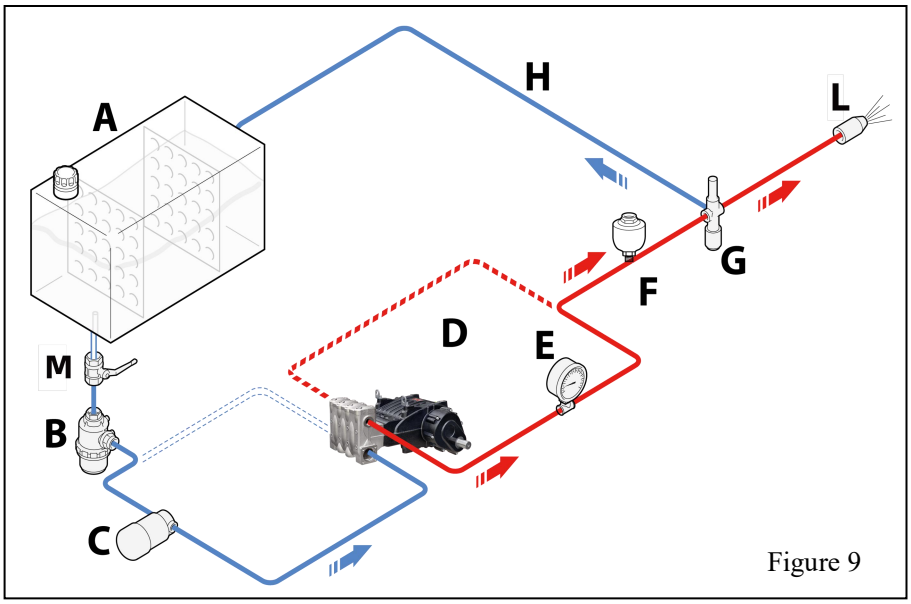


Figure 9

9.7.4 Precautions for use

Before starting, the operator must conduct necessary safety checks.

When the high-pressure pipeline leaks, immediately stop the pump operation and eliminate the cause of the leakage.

The use of the pump should not exceed the standard parameter range specified by the manufacturer.

When the ambient temperature is close to 0 ℃, if the system needs to be shut down, the pump should continue to run for 10 seconds after turning off the inlet water (before stopping the system operation), ensuring that all water in the pump and the entire pipeline is discharged through the drainage pipe to prevent freezing inside the pump.

9.7.5 The filter shall be installed as close to the pump for facilitate inspection and have the following characteristics:

9.7.5.1 Filfiltration capacity at least three times the flow of the pump.

9.7.5.2 The interface size of the filter must be less than the water inlet size of the pump.

9.7.5.3 The range of filter grade is 200- -360um.

Due to the different water quality, filtration accuracy and working time, please clean the filter regularly to protect the water pump.

9.7.6 Startup and shutdown of pumps when connecting water pipes (see Figure 7)

Please start the water pump according to the following steps:	Please follow the steps below to stop the operation of the pump:
1) Open the main water supply pipeline switch L	1) Open pressure regulating valve F to relieve pressure
2) Release pressure regulating valve F to relieve pressure	2) Turn off pump C
3) Start water pump C and run it for a few minutes without pressure	3) Close the main water supply pipeline switch L
4) Adjust the pressure regulating valve F to achieve the required working pressure of the pump	

9.7.7 Pump startup and shutdown during water tank supply (see Figure 8)

Please start the water pump according to the following steps:	Please follow the steps below to stop the operation of the pump:
1) Open the main water supply pipeline switch L	1) Release pressure regulating valve F to relieve pressure
2) Release pressure regulating valve F to relieve pressure	2) Turn off pump C
3) Start water pump C and run it for a few minutes without pressure	3) Close the main water supply pipeline switch L
4) Adjust the pressure regulating valve F to achieve the required working pressure of the pump	

9.7.8 Startup and shutdown of booster pump water inlet pump (see Figure 9)

Please start the water pump according to the following steps:	Please follow the steps below to stop the operation of the pump:
1) Open the main water supply pipeline switch M	1) Release pressure regulating valve G to relieve pressure
2) Release pressure regulating valve G to relieve pressure	2) Turn off pump D
3) Start booster pump C	3) Turn off booster pump C
4) Start water pump D and run it for a few minutes without pressure	4) Close the main water supply pipeline switch M
5) Adjust the pressure regulating valve G to achieve the required working pressure of the pump	

9.8 Drain pipe road

To ensure the use of drainage pipes, follow the following rules:

a. Pipe inner diameter must be sufficient to ensure the proper flow rate. See Figure 9
b. The initial section of the pipe must be flexible hose to separate the vibration of the pump from other systems.
c. Use the high-pressure pipe and components to ensure the safety of all operations.
d. At least one suitable pressure regulating valve or relief valve (relief valve) must be installed on the drain pipe.
e. Please use the glycerol pressure gauge as it is suitable for impact load.
f. When designing drainage pipes, pay attention to the loss of pipeline friction.
g. If necessary, an accumulator can be installed on the pressure line to reduce the pulsation of the pump.

9.9 Determination of Inner Diameter of Pipeline

To determine the inner diameter of the pipeline, please follow Figure 10 below
For example:

Water supply pipe

Flow rate of 400L/min, water flow velocity of 1m/s
Connect the 400L/min on the left side and 1m/s on the right side of the chart, with the coordinate value in the middle being 90mm, which is the inner diameter.

A drain

Flow rate of 400L/min, water flow velocity of 5.5m/s
Connect the 400L/min on the left side and 5.5m/s on the right side of the chart, with a coordinate value of 40mm in the middle, which is the inner diameter.

Optimal flow rate

Water supply ≤ 1 meter/second
Water output ≤ 5.5 meters/second

This chart does not take into account the resistance pressure drop of the pipeline itself, the resistance pressure drop of the valve, the load loss of the pipeline, and the viscosity of the liquid.

9.10 Synchronous belt drive

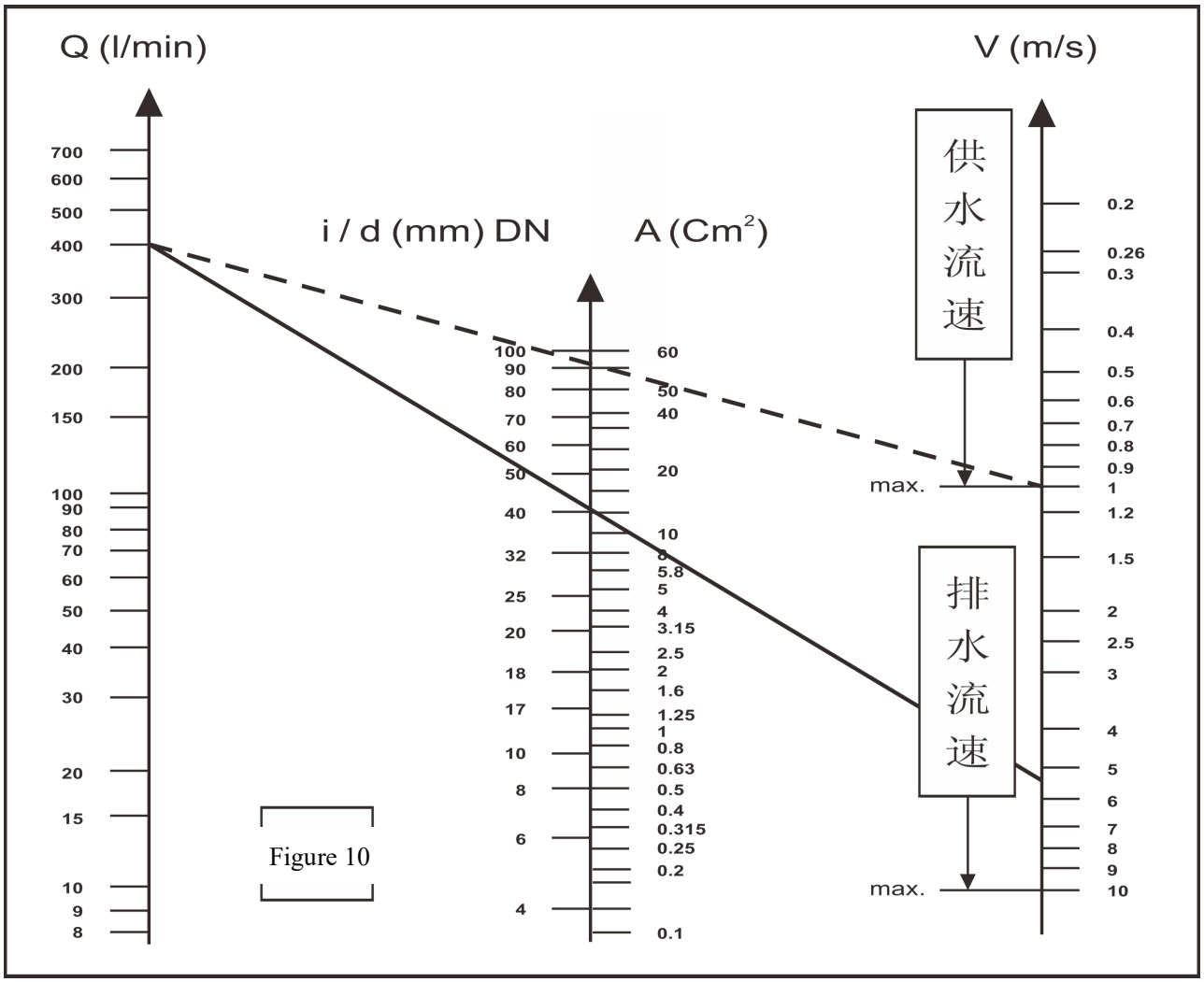


Figure 10

This pump can be driven by synchronous belt, trapezoidal tooth synchronous and circular arc tooth synchronous belt. The characteristics and transmission force of each belt can be found in the national standard or provided by the manufacturer.

10、Start and run

10.1 Pre start inspection

Please ensure that the water supply pipe has been connected and filled with water. It is prohibited to operate the pump without water inlet.

10.1.1 The water supply pipe has good sealing and cannot leak air.

10.1.2 Confirm that the switch valve between the water source and the pump has been opened, and water can smoothly enter the pump. Adjust the pressure regulating valve on the outlet pipe to the unloading mode to allow the air inside the pump to be smoothly discharged, so that the pump can start smoothly.

10.1.3 Confirm that all water supply/drainage pipelines are securely connected.

10.1.4 The coaxiality of the coupling, the tension of the pulley, and the inclination error of the power take-off shaft all meet the standards of the supporting manufacturer.

10.1.5 Confirm that the lubricating oil level is in the correct position, and the oil level can be verified using an oil dipstick or side oil level.

10.1.6 When the pump is in a horizontal position as shown in Figure 11, add oil until the oil reaches more than half of the oil level mark.

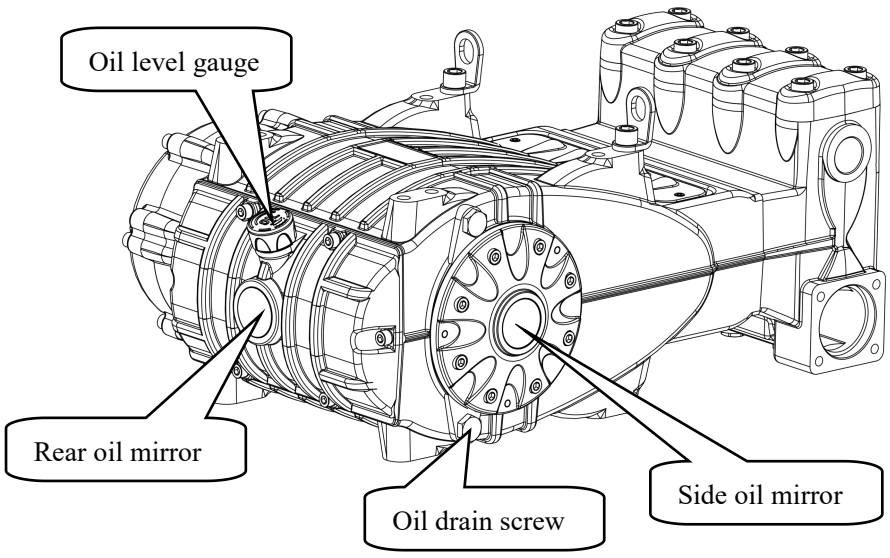


图 11

10.2 Start

If you park for a long time or restart after maintenance, please follow the following steps

10.2.1 During the first start, check whether the rotation direction is correct.

10.2.2 Check whether the water supply is sufficient.

10.2.3 Without any load, start the pump (namely the outlet pipe pressure is zero).

10.2.4 During operation, check the speed of the pump and shall not exceed the rated speed of the pump.

10.2.5 The pump must be operated for at least 3 minutes before adjusting the pressure.

10.2.6 Before stopping the pump, discharge the pipeline pressure through the unloading valve.

11. maintenance precautions

Before any maintenance work, first remove all pressure in the entire system circuit and cut off all power driving the pump.

After maintenance, check for tools, rags or other items near the operating parts or danger area before you restart the water pump.

Replace overworn parts with original parts and use lubricants as recommended by the manufacturer.

Handle worn parts and lubricants according to relevant laws.

Follow the instructions provided by the manufacturer to maintain pump performance and safety.

Maintenance interval	components and parts	step
Every working day	filter	Check the filter element
	pump	Check the oil level
Every 50 hours were worked	Connection between pump and power plant (pulley, belt, coupling, etc.)	check up
	pump	Check the installation parts
	Plumbing and joints	check up
Every 500 hours were worked	Crankcase and gear box	change oil
Every 1500 working hours	Unidirectional valve, sealing component	Check every 500 hours if there is no damage

12、Storage

12.1 Method of filling the pump with anti-corrosion emulsion or antifreeze using an external diaphragm pump (according to the layout provided in Figure 7 of 9.7)

A) Close the filter.(If open)

B) Make sure the connections are clean, grease and connect them to high pressure drains.

C) Attach the suction pipe to the diaphragm pump and connect it to the suction port of the pump.

D) Fill the preservative emulsion and antifreeze into the container.

E) Insert the free end of the pipe and the high pressure drain into the container.

F) Start the diaphragm pump.

G) Pump the preservative until the preservative / antifreeze flows out of the high-pressure water pipe.

H) Let the pump absorb the preservative / antifreeze for a few minutes. Adding "shell donax" to a preservative / antifreeze enhances its performance.

I) Stop the pump, remove the pipe from the water suction port connector, and plug the plug.

J) Remove the hose from the high-pressure drain pipe, clean the drain pipe and plug the connection point and the pipe.

12.2 The hose

A) Dry the connection point with compressed air before lubrasing and protecting the hose as per the procedure described previously.

B) Fill it up with polyethylene.

C) Do not roll too tightly and make sure it is not folded.

13. Frozen prevention

Refer to Section 12.1 to prevent freezing by different regions and by time of the year.

The following methods can also be applied to prevent freezing:

Connect the compressed air to the pump inlet to drain the water from the pump and the drainage pipe.

When freezing, the pump can not be operated for any reason until the line is completely thawed, which can prevent serious damage to the pump.

14. Common fault phenomena and troubleshooting methods

1）Pump vibration or impact

Performance phenomenon	Causes	Resolvent
*Pump vibration *The pump has abnormal noise *Pipeline vibration *Unstable pressure *Unstable water output	There is air in the pump or pipeline	The pump runs without load for a period of time to exhaust the air;
	Insufficient water supply due to dirty and clogged filters	Clean the filter
	The inlet and outlet valves are stuck, not opened, severely worn, and the valve seat is damaged	Clean or replace the water valve
	Abnormal operation of pressure regulating valve	Check the pressure regulating valve or replace it
	Overflow valve pipeline blockage	Check the pipeline

2）The water pump has no pressure or insufficient pressure during operation

Performance phenomenon	Causes	Resolvent
When the pump is working, there is no water output, no pressure, or insufficient pressure	Insufficient water supply, water supply pipeline malfunction	Check if the water supply pipeline and filter are smooth, and if the water supply valve is open
	The water pump speed has not reached the required speed	Increase the rotational speed
	Water seal damage and leakage	Replace the water seal
	Damaged plunger	Replace the plunger
	Internal leakage caused by wear of inlet and outlet check valves	Replace the one-way valve
	Improper adjustment or damage of pressure regulating valve	Readjust the pressure regulating valve or replace it
	Leakage or damage of unloading valve	Check the unloading valve or replace it
	The nozzle aperture and quantity do not match or wear increases	Reduce the number of nozzles or replace them

3) Water pump bottom leakage/observation hole leakage/oil leakage

Performance phenomenon	Causes	resolvent
make water	Water seal wear: 1. Normal wear and tear 2. The water filtration accuracy does not meet the requirements 3. Water shortage and dry operation 4. The inlet and outlet water check valve is not open for water shortage due to scale bonding	Replace the water seal
	The plunger is damaged: 1. Normal wear and tear 2. Lack of water dry operation produces high temperature, cold water contact with it and produce cracks	replace the plunger plug
oil leak	Oil seal damage: 1. Normal wear and tear 2. Too high oil temperature 3. After the water seal is worn out, the high-pressure water jet breaks the oil seal 4. The working environment is caused by impurities (such as fine sand) from the bottom leakage hole to the plunger.	Replace the oil seal

4) The noise of the pump is worn and the gearbox is noisy

Performance phenomenon	Causes	resolvent
Noise of the pump for large connecting rod wear	1. Air inhalation in the water supply system	Tighten the joint at the water inlet
	2. The inlet and outlet water check valve spring is damaged or broken	Replace one-way valve
	3. The check valve has a foreign body blockage	Clean one-way valve
	4. Bearing wear and tear	Replace the bearing
	5. The water inlet temperature is too high	Reduce the inlet temperature
The gearbox is loud	1. Gear wear	Change the gear
	2. Bearing wear and tear	Replace the bearing

5) The pump temperature is too high

Performance phenomenon	Causes	resolvent
The pump temperature is too high	1. The pump operating pressure is too high	Reduce the pressure island rated pressure Return normal belt tension Recalibrate the pulley-drive coupling
	2. The drive belt is too tight	
	3. The pulley and drive coupling are not calibration	
	4. The lubricating oil is not replaced for a long time or the lubricating oil model is not suitable for use	Replace lubricating oil

15、Warranty terms **(inlet and outlet check valves and high and low pressure seals are vulnerable parts and are not covered by the warranty)**

The warranty period and warranty terms are both included in the purchase contract. The following situations are not covered by warranty

A) The pump is not intended for an agreed upon purpose of use

B) Overloaded work

C) The safety equipment has not been calibrated or installed.

D) The accessories and components used in the pump are not original components.

E) Damage caused by the following reasons

① Incorrect use

② Not following maintenance guidelines

③ Not operating according to the user manual

④ Insufficient water supply

⑤ Installation error

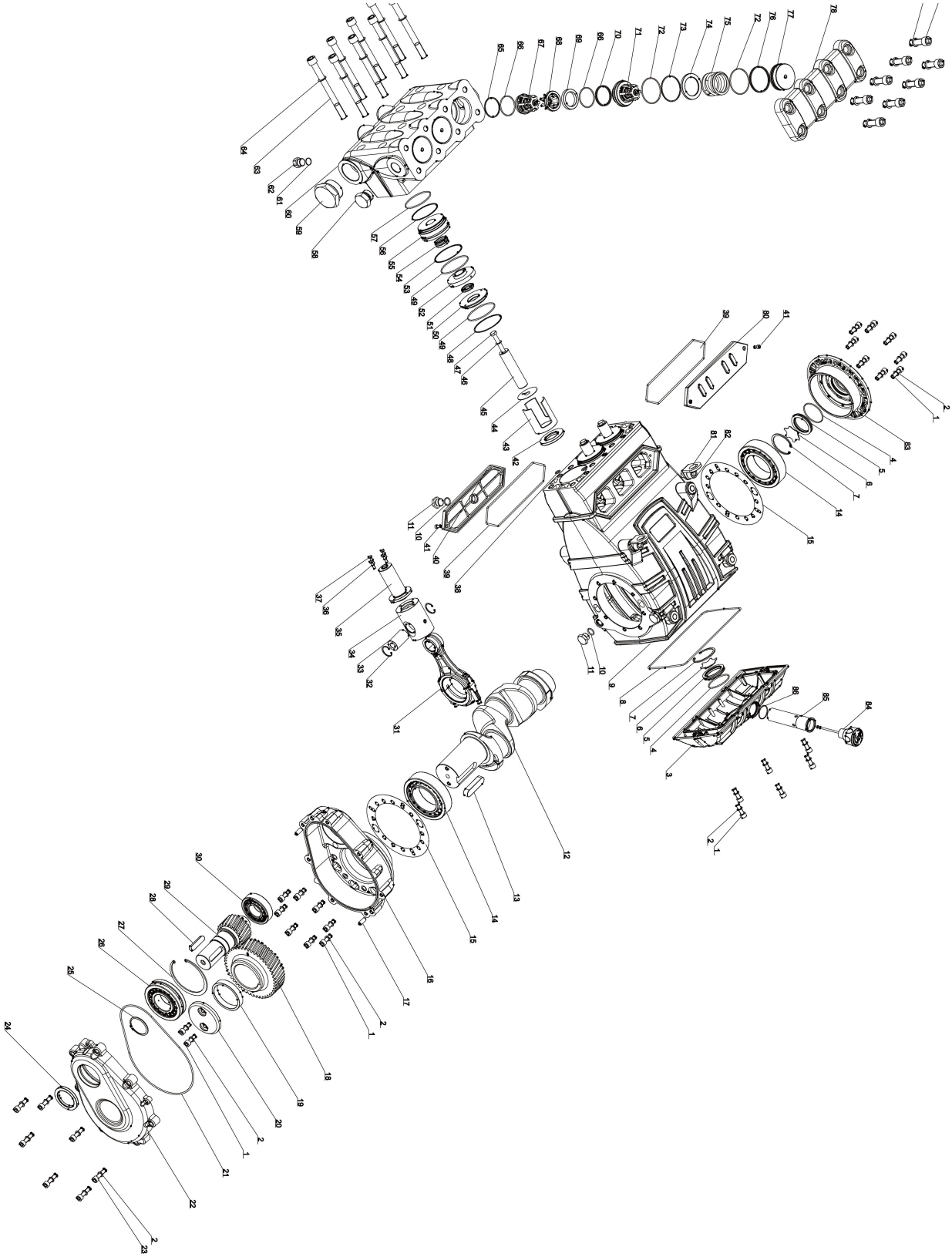
⑥ Pipeline mismatch

⑦ Unauthorized disassembly

⑧ Airhole phenomenon

16、EXPLODED VIEW AND SPARE PARTS LIST

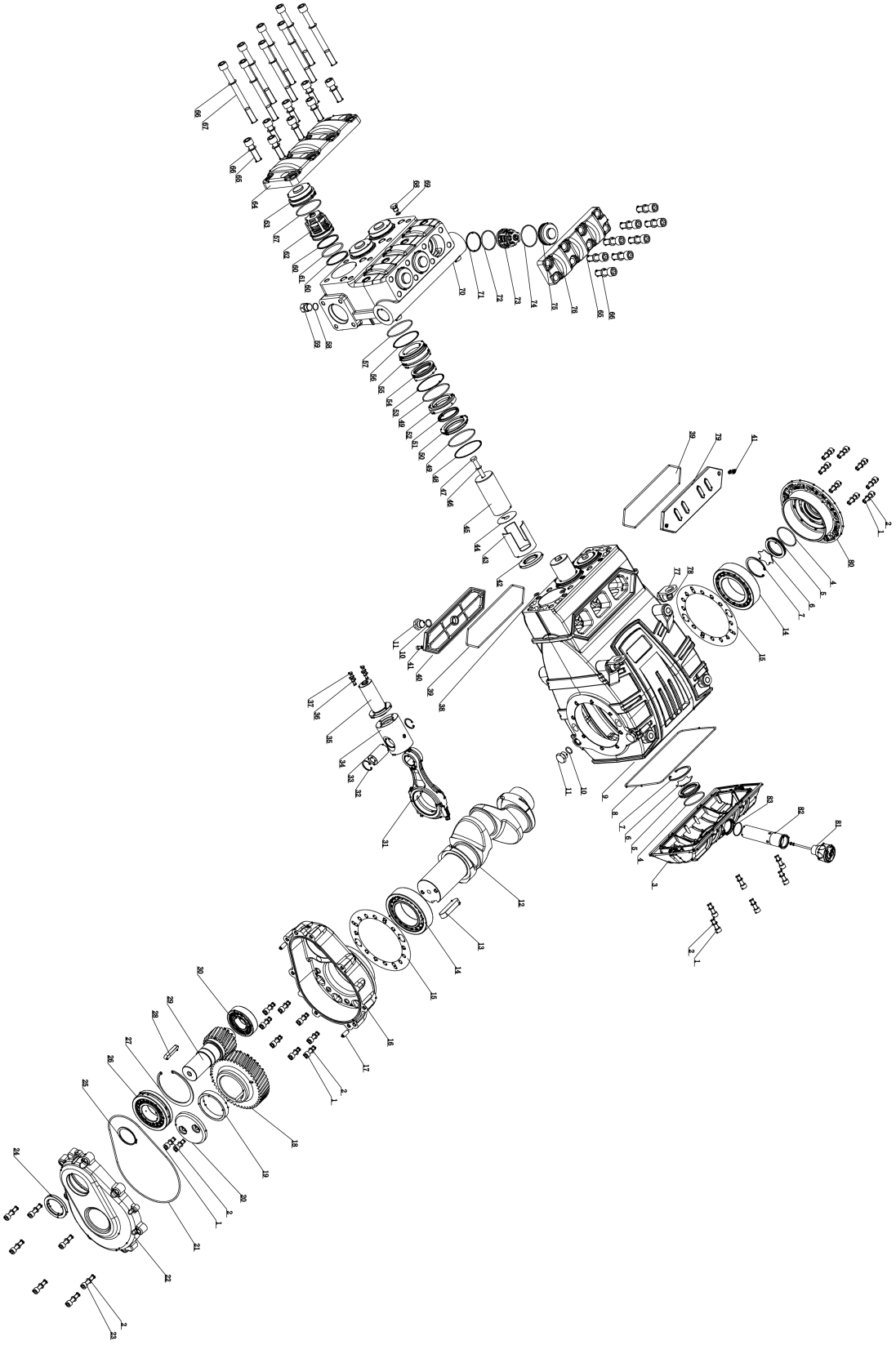
16.1 FW Series Exploded View



FW Series Spare Parts List：

No.	Name	Q'ty	No.	Name	Q'ty
1	Hexagon round head screws	24	44	FW file water flakes	3
2	Double-sided tooth spacer	31	45	FW28 ceramic tube	3
3	FW back cover	1	46	FW copper gasket	3
4	O-rings	2	47	FW ceramic tube locking screws	3
5	FW oil mirror	2	48	Retaining rings	3
6	FW oil level indication	2	49	O-rings	6
7	Retaining rings for holes	2	50	FW28 rear guide ring	3
8	O-rings	1	51	28 pairs of water seals	3
9	FW crankcase	1	52	FW28 support ring	3
10	O-rings	3	53	Open retaining rings	3
11	Plugs	3	54	28 main water seal three-piece set	3
12	FW crankshaft	1	55	FW28 main water seal bushing	3
13	Flat keys	1	56	Open retaining rings	3
14	Tapered roller bearings	2	57	O-rings	3
15	FW gaskets	2	58	Plugs	1
16	FW gearbox body	1	59	Plugs	1
17	FW gearbox dowel pins	2	60	FW40 pumphead	1
18	FW driven gears	1	61	O-rings	3
19	FW driven gear washers	1	62	Plugs	3
20	FW driven gear platen	1	63	Hexagon round head screws	8
21	O-rings	1	64	Double-sided tooth pads	16
22	FW gearbox cover	1	65	Retaining rings	3
23	Hexagon round head screws	7	66	O-rings	6
24	TC skeleton oil seal	1	67	FW40 Water Inlet Check Valve Assembly	3
25	Retaining rings for shafts	1	68	FW40 check valve support frame	3
26	Spherical roller bearings	1	69	FW40 check valve support gasket	3
27	Retaining rings for holes	1	70	Open retaining rings	6
28	Flat keys	1	71	FW40 outlet check valve assembly	3
29	FW drive gears	1	72	O-rings	6
30	Tapered roller bearings	1	73	Retaining rings	3
31	FW linkage assembly	3	74	FW40 outlet check valve pressure ring	3
32	Retaining rings for holes	6	75	FW40 plug spring	3
33	FW plunger pin	3	76	Open retaining rings	6
34	FW piston	3	77	FW40 valve plug	3
35	FW plunger rod	3	78	FW40 bonnet	1
36	Double-sided tooth pads	12	79	Hexagon round head screws	8
37	Hexagon head bolts	12	80	FW crankcase upper cover	1
38	O-rings	6	81	FW Eyebolts	2
39	O-rings	2	82	Hexagon round head screws	2
40	FW crankcase lower cover	1	83	FW left side cover	1
41	Hexagon round head screws	4	84	FW Oil Mark Components	1
42	TC4 skeleton oil seal	3	85	FW oil mark bushing	1
43	FW support frame	3	86	O-rings	1

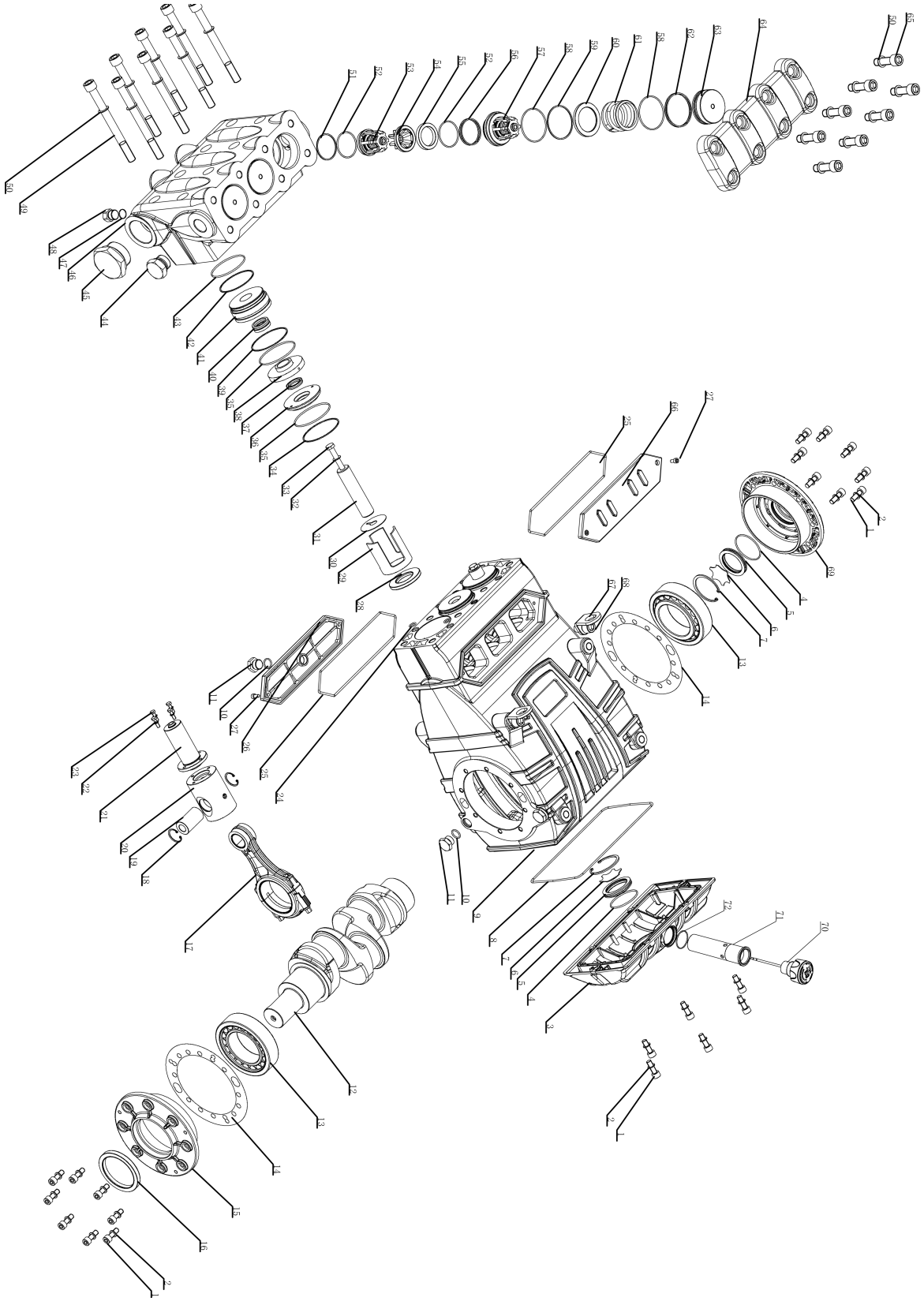
16.2 FW55 Series Exploded View



FW55 Series Spare Parts List：

No.	Name	Q'ty	No.	Name	Q'ty
1	Hexagonal socket head screw	24	43	FW support bracket	3
2	Double sided toothed gasket	37	44	FW water film	3
3	FW back cover	1	45	FW50 ceramic tube	3
4	o-ring	2	46	FW copper gasket	3
5	FW oil mirror	2	47	FW ceramic tube locking screw	3
6	FW oil level indicator	2	48	Retaining Ring	3
7	Elastic retaining ring for holes	2	49	o-ring	6
8	o-ring	1	50	FW50 rear guide ring	3
9	FW crankcase	1	51	50 pairs of water seals	3
10	o-ring	3	52	FW50 support ring	3
11	plug	3	53	split washer	3
12	FW crankshaft	1	54	50 main water seal three piece set	3
13	flat key	1	55	FW50 main water seal liner	3
14	Tapered Roller Bearings	2	56	split washer	3
15	FW sealing gasket	2	57	o-ring	6
16	FW gearbox	1	58	o-ring	6
17	FW gearbox positioning pin	2	59	FW plug	6
18	FW driven gear	1	60	Retaining Ring	6
19	FW driven gear washer	1	61	o-ring	6
20	FW driven gear pressure plate	1	62	FW55 inlet one-way valve component	3
21	o-ring	1	63	FW55 inlet check valve plug	3
22	FW gearbox cover	1	64	FW55 inlet valve cover	3
23	Hexagonal socket head screw	7	65	Hexagonal socket head screw	1
24	TC skeleton oil seal	1	66	Double sided toothed gasket	16
25	External retaining ring	1	67	Hexagonal socket head screw	24
26	self-aligning roller bearing	1	68	FW plug	8
27	Elastic retaining ring for holes	1	69	o-ring	3
28	flat key	1	70	FW55 pump head	3
29	FW active gear	1	71	Retaining Ring	1
30	Tapered Roller Bearings	1	72	o-ring	3
31	FW linkage component	3	73	FW40 inlet one-way valve component	3
32	Elastic retaining ring for holes	6	74	o-ring	3
33	FW plunger pin	3	75	FW55 outlet one-way valve plug	3
34	FW piston	3	76	FW55 outlet valve cover	3
35	FW plunger rod	3	77	FW lifting ring	1
36	Double sided tooth pad	12	78	Hexagonal socket head screw	2
37	Hexagon headed bolt	12	79	FW crankcase cover plate	2
38	o-ring	6	80	FW left cover	1
39	o-ring	2	81	FW oil label component	1
40	FW crankcase lower cover plate	1	82	FW oil standard liner	1
41	Hexagonal socket head screw	4	83	o-ring	1
42	TC4 skeleton oil seal	3			

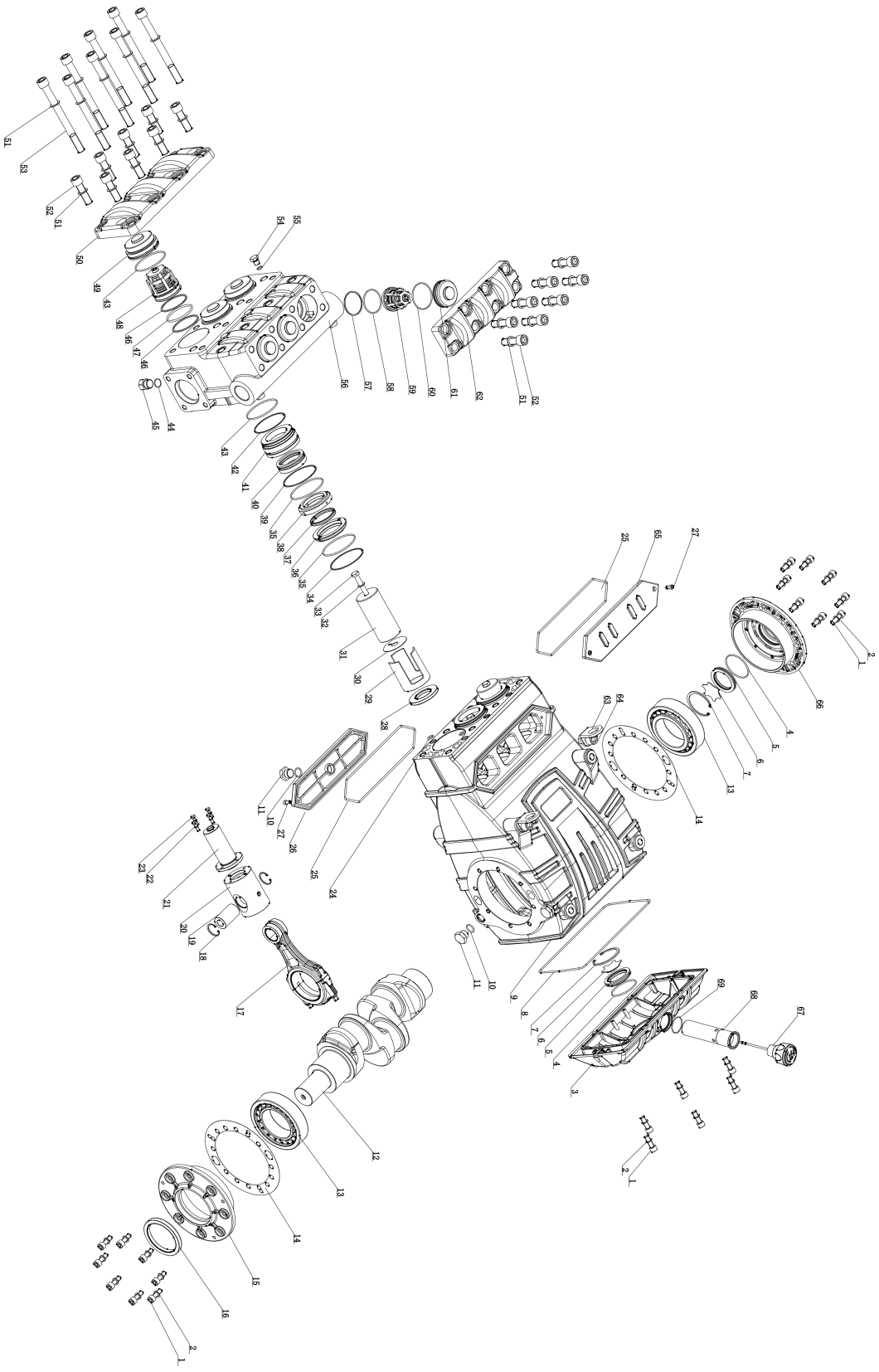
16.3 FV Series Exploded View



FV Series Spare Parts List：

No.	Name	Q'ty	No.	Name	Q'ty
1	Hexagon round head screws	22	37	28 pairs of water seals	3
2	Double-sided tooth pads	28	38	FW28 support ring	3
3	FW back cover	1	39	Open retaining rings	3
4	O-rings	2	40	28 main water seal three-piece set	3
5	FW oil mirror	2	41	FW28 main water seal bushing	3
6	FW oil level indication	2	42	Open retaining rings	3
7	Retaining rings for holes	2	43	O-rings	3
8	O-rings	1	44	Plugs	1
9	FW crankcase	1	45	Plugs	1
10	O-rings	3	46	FW40 pumphead	1
11	Plugs	3	47	O-rings	3
12	FV crankshaft	1	48	FW plug	3
13	Tapered roller bearings	2	49	Hexagon round head screws	8
14	FW gaskets	2	50	Double-sided tooth pads	16
15	FV protruding end flange	1	51	Retaining rings	3
16	TC oil seals	1	52	O-rings	6
17	FW linkage assembly	3	53	FW40 Water Inlet Check Valve Assembly	3
18	Retaining rings for holes	6	54	FW40 check valve support frame	3
19	FW plunger pin	3	55	FW40 check valve support gasket	3
20	FW piston	3	56	Open retaining rings	6
21	FW plunger rod	3	57	FW40 outlet check valve assembly	3
22	Double-sided tooth pads	12	58	O-rings	6
23	Hexagon head bolts	12	59	Retaining rings	3
24	O-rings	6	60	FW40 outlet check valve pressure ring	3
25	O-rings	2	61	FW40 plug spring	3
26	FW crankcase lower cover	1	62	Open retaining rings	6
27	Hexagon round head screws	4	63	FW40 valve plug	3
28	TC4 skeleton oil seal	3	64	FW40 bonnet	1
29	FW support frame	3	65	Hexagon round head screws	8
30	FW file water flakes	3	66	FW crankcase upper cover	1
31	FW28 ceramic tube	3	67	FW Eyebolts	2
32	FW copper gasket	3	68	Hexagon round head screws	2
33	FW ceramic tube locking screws	3	69	FW left side cover	1
34	Retaining rings	3	70	FW Oil Mark Components	1
35	O-rings	6	71	FW oil mark bushing	1
36	FW28 rear guide ring	3	72	O-rings	1

16.4 FV55 Series Exploded View



FV55 Series Spare Parts List：

No.	Name	Q'ty	No.	Name	Q'ty
1	Hexagonal socket head screw	22	36	FW50 rear guide ring	3
2	Double sided tooth pad	22	37	50 pairs of water seals	3
3	FW back cover	1	38	FW50 support ring	3
4	o-ring	2	39	split washer	3
5	FW oil mirror	2	40	50 main water seal three piece set	3
6	FW oil level indicator	2	41	FW50 main water seal liner	3
7	Elastic retaining ring for holes	2	42	split washer	3
8	o-ring	1	43	o-ring	6
9	FW crankcase	1	44	o-ring	6
10	o-ring	3	45	FW plug	6
11	plug	3	46	Retaining Ring	6
12	XV crankshaft	1	47	o-ring	3
13	Tapered Roller Bearings	2	48	FW55 inlet one-way valve component	3
14	FW sealing gasket	2	49	FW55 inlet check valve plug	3
15	XV extended end flange	1	50	FW55 inlet valve cover	1
16	TC oil seal	1	51	Double sided tooth pad	24
17	FW linkage component	3	52	Hexagonal socket head screw	16
18	Elastic retaining ring for holes	6	53	Hexagonal socket head screw	8
19	FW plunger pin	3	54	FW plug	3
20	FW piston	3	55	o-ring	3
21	FW plunger rod	3	56	FW55 pump head	1
22	Double sided tooth pad	12	57	Retaining Ring	3
23	Hexagon headed bolt	12	58	o-ring	3
24	o-ring	6	59	FW40 inlet one-way valve component	3
25	o-ring	2	60	o-ring	3
26	FW crankcase lower cover plate	1	61	FW55 outlet one-way valve plug	3
27	Hexagonal socket head screw	4	62	FW55 outlet valve cover	1
28	TC4 skeleton oil seal	3	63	FW lifting ring	2
29	FW support bracket	3	64	Hexagonal socket head screw	2
30	FW water film	3	65	FW crankcase cover plate	1
31	FW50 ceramic tube	3	66	FW left cover	1
32	FW copper gasket	3	67	FW oil label component	1
33	FW ceramic tube locking screw	3	68	FW oil standard liner	1
34	Retaining Ring	3	69	o-ring	1
35	o-ring	6			