

A&V WATERJET
A12X2
OPERATION AND
MAINTENANCE MANUAL



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Chapter One: Introduction

1.1 Outline

Ultra-high pressure water jet is an industrial tool that using a stream of high pressure water for cutting purpose. It can be used to cut virtually any material such as metal, stone, glass and composite, etc. It has the advantages of a narrow cutting kerf width, high cutting precision, smooth cutting edges, no chemical and thermal deformation. The utilization and productivity is greatly increased. Water jet cutting machine in the future will be used as a kind of cutting method with high efficiency, energy saving, environmental protection and it will replace the traditional machining technology. Its application will bring significant economic benefits and social benefits.

The water jet cutting machine has been widely used in many fields worldwide. It has been applied in fields of building decoration, automobile manufacturing, aerospace, food, paper making, electronics, textile and other industries. The application range of water jet cutting machine is potentially enlarged. With the cost of water jet cutting machine keeping reduced, the universality of application will be further improved

Ultra-high pressure pump is the power source of water jet cutting machine, as well as the core of the whole system. The quality of ultra-high pressure pump determines the operation of the whole machine. We constantly cooperate with the international famous enterprises to research and develop and improve the quality of our products to increase product reliability. The level of technology is enhanced, and our high pressure pump is in the leading position in China.

1.1.1 The specific use of ultra-high pressure pump

A&V ultra-high pressure pump is designed for a new generation water jet cutting machine. A&V ultra-high pressure pump should be used with suited cutting table and cnc system which is produced by our company.

A&V ultra-high pressure pump should apply with specific working conditions and maintenance conditions.

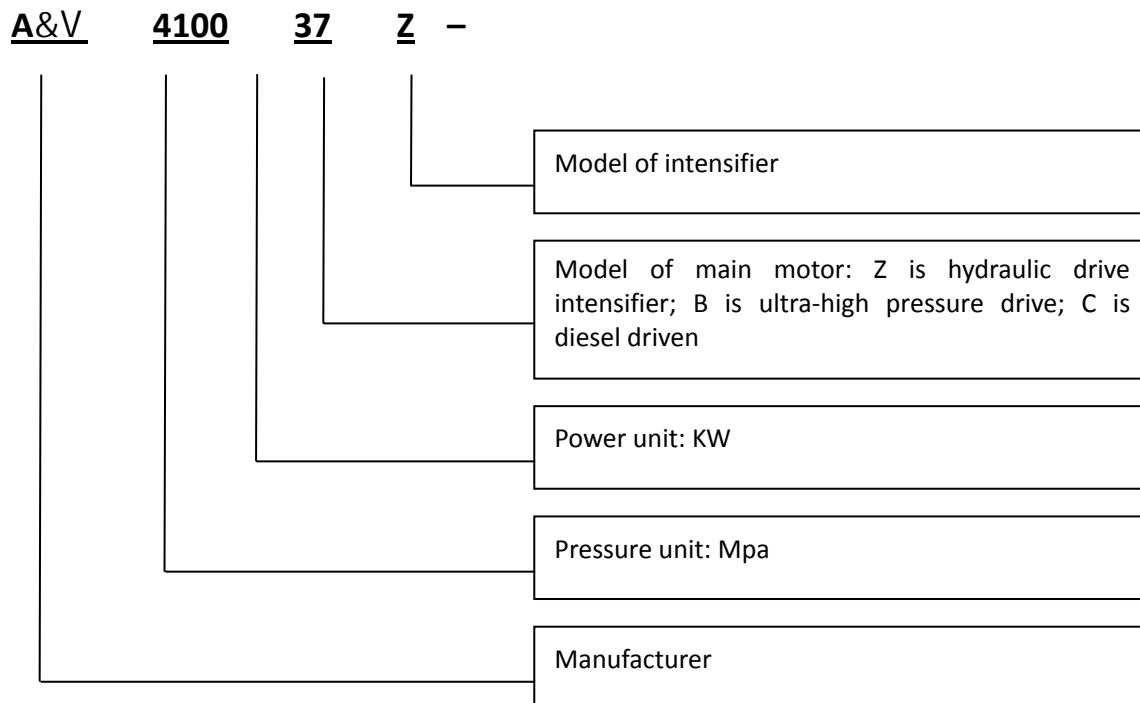


Using the pump for a different purpose or modifying the pump without the written authorization of the manufacturer is considered to be non-authorized usage. Manufacturers should not be liable for the losses due to such situation. Related risks shall be borne by the user alone.



The cutting machine must be used with the accessory produced by our company. Against the above and the content of operating instruction would result severe damage of the equipment and personal injury.

1.1.2 Models of high pressure pump



1.2 The characteristic of the pump and optional components

Since the foundation of our company, we have been cooperating with famous companies internationally, and accumulate a lot of experience and technology. After the constant improvement and upgrade, our products enjoy stable quality and excellent performance, which is able to meet the requirements of the market.

1.2.1 The Performance and Characteristic of the pump

- Simple structure, easy to maintain and fix
- All core parts of ultra-high pressure pump are imported
- Long service life of wearing spare parts to reduce operation cost
- Use electronic directional control valve, accurate and stable
- Piston rod is made from special ceramics with extremely long service life
- Use PLC instead of relay to improve the stability
- Adopt large high pressure accumulator to guarantee the stability and cutting efficiency
- Adopt servo hydraulic oil pump to reduce energy consumption

1.2.2 Optional components

The following accessory can be used when user buy a new water jet or upgrade an existing water jet.

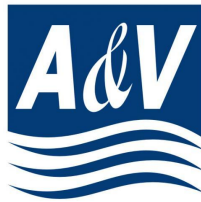


- Auto abrasive delivery system
More convenient abrasive supply; reduce the labor intensity of operators; increase the working efficiency.
- Auto height adjustment system
Constantly detect and adjust the height between the cutting head and the material during cutting process. Move the cutting head up and down along with the surface of the material.
- Dynamic cutting head
It is a perfect combining of mechanical structure and cnc software. Perfectly solve the taper problem.

1.3 Product Support

Problems on machine installation and maintenance can be solved by calling A&V Water-Jet customer service. We will provide phone call assistant or onsite technical assistant depending on the problem.

Please contact company's customer service for details



Customer service

A&V Waterjet Tech. Inc.

Tel: (262)250-8100

Fax: (262)250-8690

E-mail: sales@avwaterjet.com



1.4 Accessories

A&V Waterjet has accessories department with sufficient inventory and trained professional personnel. Urgent shipment is available if it is required. Please contact with A&V Waterjet customer service and accessories department for detail information.







Chapter Two: Safety

2.1 Outline

With the development of ultra-high pressure water jet technology, it is much safer to use water jet than other equipment. But there will still be safety risks due to the improper use, operation, maintenance or other factors. Therefore, it is very important to learn all the instruction in this manual. Other than the rules in this instruction, the user must also abide by the local safety regulations

High pressure water jet cutting system is a very powerful cutting tool. Do not touch the high pressure stream in any cases. Otherwise, it may cause severe injury to your body.

2.2 Safety Signs

 Warning	It indicates there will be danger. Ignore this sign would cause serious personal injury, death or damage on machine.
 Caution	In order to prevent personal injury and equipment damage, these important instructions must be followed.
 Notice	Pay attention to the important terms in the instruction. It may cause severe damage on the equipment If these are ignored.
 Warning	Shut down the power supply before open the electric cabinet, in order to prevent the personal injury.
 	Always wear approved safety goggles whenever cutting.
 	In order to reduce the risk of hearing loss, always wear hearing protection.



There will be pollutant and particle in the air during the cutting process. Always wear mask.

The signs above are to arouse the attention of users, and to help them avoid danger. Although we are trying to point out all the potential dangers, there may still many unpredictable problems due to improper operation or other reasons. It may cause the damage of the machine or personal injury. It is the user's duty to minimize the dangers.

2.3 Normal Safety

Users are expected to know how to safely use the tools and safely operate ultra-high pressure water jet. This instruction explicitly indicates the danger during the operation and maintenance of All-Powerful brand ultra-high pressure pump.

This safety instruction is based on the common situation and cannot be involved in every possible situation. Only when the user gets a comprehensive understanding of the equipment, it is able to provide the best safety.

Powerful water jet can penetrate almost all of the material. So do not touch water stream in any cases.



Warning

Seek immediate medical attention in the event of a water jet injury. Injuries caused by high-pressure water jet are serious. Do not delay!

Only a qualified operator is allowed to operate the pump.
Always wear safety glasses when operating the machine or near the machine.
Always clean and check the equipment. Solve all the problems immediately.



Warning

This operation manual is a part of the system. The operator should abide by these operating rules at all time.

2.4 Personnel Safety

All water jet cutting equipment operation, maintenance personnel or the equipment shall comply with the following safety precautions.

- Operation and maintenance personnel must be well trained. And the personnel should obtain the qualified certificate.
- Operators should always implement the safety requirements, avoiding the possibility of personal injury and unnecessary equipment downtime.
- It is required to clearly defined and abide by the ultra-high pressure jet pump operation instruction.
- Make sure that all protective devices, shield, or protective cover, etc should always be

- placed on the related equipment correctly.
- It is required that equipment surrounding areas should be clean, no oil spill and sundries, etc.
- It is required to wear safety glasses and gloves when operating the machine.
- The user must operate the water jet cutting machine when it is in a good condition.
- If there's any potential danger in ultra-high pressure pump, the operator must immediately stop working and report to the owner.
- Before the operation and maintenance, the operator must carefully read the operation instruction. It is required to operate and maintain the machine according to the specified requirements. Please pay attention to safe operation and maintenance.

2.5 Safe Operation and Maintenance

Operation and maintenance of the system shall be conducted by professional personnel.

2.5.1 Safe Operation



Warning

If you don't follow these instructions: "correctly wear safety helmet, safety shoes, hearing protection and some personal protection device", it is likely to cause personal injury or death.



Always wear approved safety goggles whenever cutting



In order to reduce the risk of hearing loss, always wear hearing protection.



There will be pollutant and particle in the air during the cutting process. Always wear mask.

- Make sure to read and understand this instruction before operating the equipment. Stay a safe distance from the equipment for non-operating workers.

2.5.2 Safe Maintenance



Warning

Shut off the power before the maintenance

Electrical box and wiring box may cause electrical hazard. Before open the electrical box, must lock out power first.



Notice

During the normal work, the high-pressure water parts and hydraulic parts will be very hot. Malfunction parts may also be very hot during operation.



Warning

Even the power is off; the system may still have high pressure water and/or hydraulic pressure. When the pump is powered off, it's better to open the gas valve for a few seconds, in order to discharge all of the pressure in the system.



Warning

The water jet should be shut off before maintenance.

- To minimize the risks, the guide must be read by users carefully before operation. There is a lot of important information in this manual.
- Use special tools for maintenance, which makes the operation more easily, and can prevent damage of the equipment.
- Before operating the machine, put all the tools in the tool box and take away.
- The ultra-high pressure pump should be checked after the maintenance. Then start the pump according to the operation manual.

2.6 Safety of Electrical System



Warning

Lock out power before maintenance.

- Before starting maintenance, please shut down the main power circuit breaker. Non-professional personnel shall not operate if there is any warning tag.
- When replacing wires, use original wire sizes, types, and the same color.

- Turn on the electrical switch after maintenance. Close the cover before restart the machine.
- Check E-stop function

2.7 Safety of High Pressure Water System

- Don't get close to high pressure water stream. High pressure water can penetrate any part of the body. Without appropriate treatment, it is likely to lead to infection or even death. If you are harmed by the high pressure water jet, please seek medical treatment immediately.
- Don't try to repair leaking point when the high pressure pump is working. The leaking point may spray high pressure water. So make sure the power is shut off and all the high pressure water is discharged before maintenance.
- High pressure pipe connection on the intensifier should use right angle mounting components. Otherwise too much bending stress and vibration may deform the part. Unexpected breakdown can cause serious damage to your body.
- Use two wrenches to tighten and lose the high pressure fittings: one to hold the nut, the other to tighten or lose. Using only one wrench may over bend the high pressure tube and cause damage.
- Use high pressure pipe provided by A&V Waterjet.

2.8 Safety of Hydraulic System



Warning

High pressure water can penetrate any part of the body. Seek immediate medical attention in the event of a water jet injury.

- After maintenance, make sure all the high pressure lines are connected correctly.
- Keep a distance away from the high pressure water stream. Do not touch the leading point by hand directly. Use a piece of cardboard or other materials if needed. Wear safety gloves and glasses, and some other suitable protection devices.
- Don't try to lose or disconnect any parts unless the power is off, and all the high pressure water is discharged.

2.9 Emergency Medical Treatment



Warning

Please seek medical treatment immediately in the event of a water jet injury; otherwise it will lead to serious infections.

Water cut would cause body injury and infection. A person at any time injured by high pressure water jet should seek medical treatment immediately. Even if the surface looks like nothing, but if we do not seek treatment in time it is likely to lead to serious infection or even need for surgery.

Inform doctor that the injury is caused by abrasive water jet cutting machine, whose pressure is 55000 psi (380Mpa, 3800 kg/cm²) and the water speed is 3000 FPS (914 MPS). The water stream may contain abrasive (garnet). According to previous reports, rare infections may be caused by micro aerobic microorganism at low temperature, such as gram-negative pathogens found in the sewers. Therefore, use fine medical cotton to wipe and blood culture measures may be helpful. It is necessary to disposal such damage in accordance with acute surgical emergency and shall be conducted by a qualified surgeon doctor. Speeding the blood circulation may get worse, so, please do not heat the injured area.

Emergency treatment: (1) diagnosis of injured area; (2) antibiotic; (3) keep the injured on an empty stomach (NPO)

Chapter Three: Installation

3.1 Profiles of Installation

In this section, there will be details of installation requirements and procedures. These operating rules require thorough understanding to all of the components, the operation system, the intensifier and the safety regulations.

Before the installation and test of ultra-high pressure pump, all intensifier installation, operation and maintenance must refer to this manual.

A&V customer service engineer can provide installation, testing and all related training for operation and maintenance.

3.2 Obligation

Both users and manufacturers shall bear the corresponding obligation during the installation of the equipment. The details are as follow

3.2.1 The Obligation of the User

A&V ultra-high pressure pump users have the duty to undertake the following obligations.



Notice

Users must bear the following obligations. It is very important to fully carry out the obligations. The bearing of the obligation is the beginning of a proper use of the equipment.

- User should provide proper personnel to handle and install of the equipment.
- Ultra-high pressure pump installation should accord with the requirement of manufacturers.
- User should prepare a suitable area for installation.
- User shall prepare all the tools and material before installation.
- Before the installation of high pressure pump, water treatment system is required if the quality of water doesn't meet the requirement in this manual.
- User is responsible for providing all the pipelines connecting to the pump, including power cables, plumbing and air tubes, etc. User should connect pipelines according to their own situation.
- During installation and process, user must provide adequate safety equipments. Please refer to section 2 for details.
- The ultra-high pressure pump that we provided does not fill with hydraulic oil. User shall fill hydraulic oil into the pump according to the oil requirement described in this manual.
- Waste generated during the installation shall be dumped to the designated recycling

place, in accord with the relevant regulations of the local environmental protection department.

3.2.2 The Obligation of the Manufacturer

A&V company is the manufacturer of the ultra-high pressure pump. A&V company and regional representatives have the duty to undertake the following obligations.

- Inform the responsibility of user for the corresponding obligations in the writing form.



Notice

A&V company is not familiar with the administrative structure of the user. The connection in writing should accord with the contact information on the contract. This may lead to the end user's confusion about his own obligation. We A&V will not be responsible for this.

- Onsite installation needs to consult with the user about the specific data and time.
- Make sure that all utilities connections have been carried out in accordance with the manual requirements.
- Start and test the high pressure pump.
- Provide appropriate training to operation and maintenance personnel.
- Follow standard system acceptance tests.

3.3 Transportation

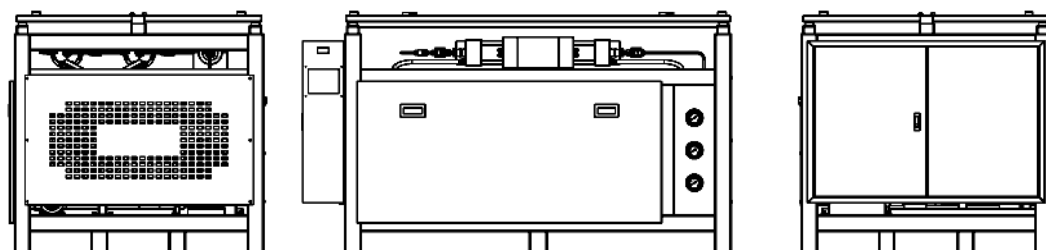
There is an uneven weight distribution of weight in ultra-high pressure pump on both ends, especially high power type ultra-high pressure pump. Don't use forklift equipment from any end of the ultra-high pressure pump equipment. Find the position of the forklift according to the center gravity of the pump.

After removing ultra-high pressure pump from the packing, please note that the position of fork groove is at the bottom, which is shown in figure 3-1. It is needed to spread the forks according to the center of gravity and balance the weight on both forks.



Notice

The high pressure pump must be lifted from the bottom. Don't try to lift the machine from either side.



3-1



Warning

If the transportation temperature and environment temperature is too low which causing the freezing of the cutting water, please don't start the machine at this moment. If encounter this situation, please call the

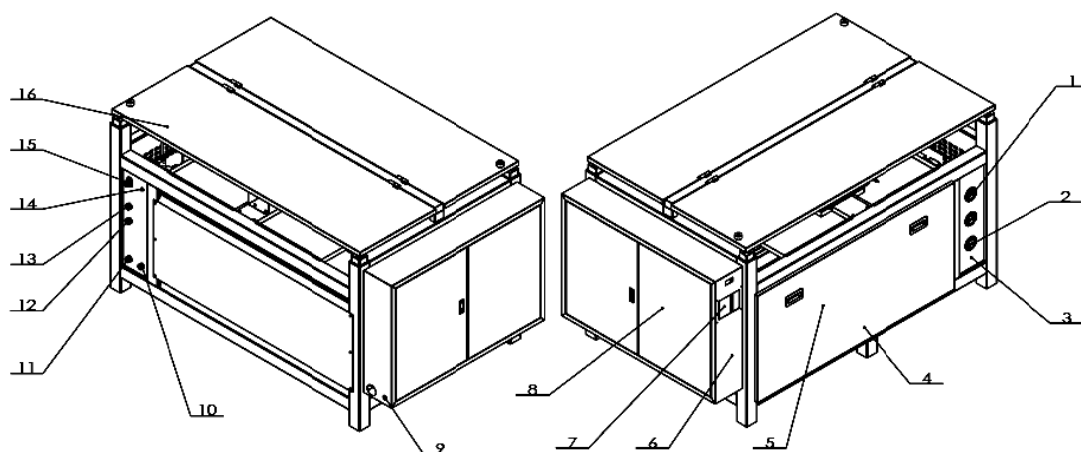


Notice

If the water jet cutting machine temperature is under the using environment temperature, it must be placed in the environment with normal working temperature for more than 72 hours.

3-1

3.4 Appearance



3-2

1	Oil pressure gauge	2	Water pressure gauge
3	Name plate	4	Product identification
5	Front cover	6	Ultra-high pressure pump electrical box

7	Control panel	8	Power switch
9	CNC cable connection socket	10	Bleed valve
11	Water outlet(cooling water)	12	Water inlet(cutting water)
13	Water inlet (cutting water)	14	Air Inlet
15	Water outlet (cutting water)	16	Top cover

3.5 The Requirement of the Site

- The environment temperature ranges from 10 °C to 30 °C. The relative humidity should be 40% ~ 75% RH.



Warning

Ultra-high pressure pump should not be installed in the place whose temperature is below zero. If the temperature is going to be below freezing point, please discharge the water in the pipe and filter in advance.

- Environment temperature for stock: - 10-50 °C.

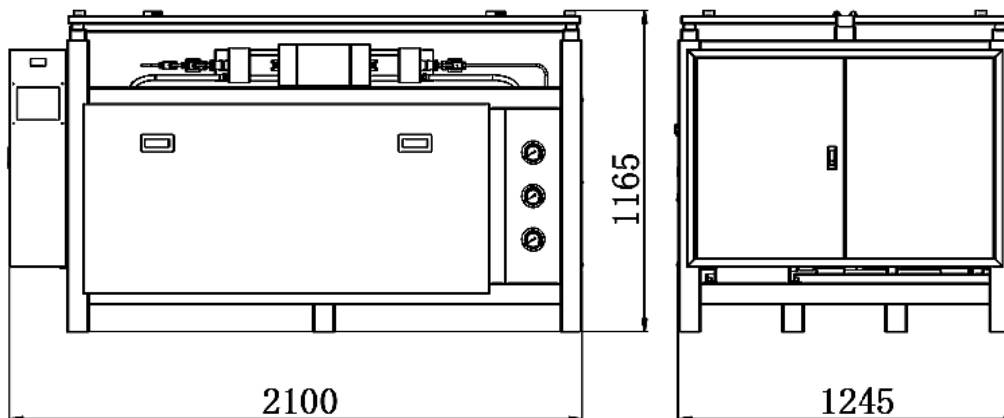


Warning

If pipes, valves are frozen, do not operate equipment. System must be completely defrosted until the water can flow freely in the system.

- Atmospheric pressure is 86 kpa-106 kpa. Dust concentration in air shall not be greater than 10 mg/m³, and shall not contain acid, salt, and corrosive gases.
- Equipment should be away from the vibration source, heat source, interference sources and heat flow. The vibration in the workshop should be under 0.5 G .
- The ground must be able to support the weight of the machine, and thick enough to resist the vibration of the machine.
- For maintenance, ultra-high pressure pump shall be set aside at least 900 mm on each side of the interval.

model	length(A)mm	width(B)mm	height(C)mm	weight(Kg)
A12X2	2100	1250	1165	1700



3-3

3.6 Power Requirement



Careful

All power supply and remote control wiring used in ultra-high pressure pump must comply with the local electrical standard and the national electrical principle.



Attention

Working voltage and ampere capacity must meet the relevant requirements.

- Three-phase five wires, 480V, 50Hz. Power cables should be the cable in size of $16 \text{ mm}^2 \times 3 + 1 \times 6 \text{ mm}^2$; the other should be grounding wires with 6 mm^2 .
- Ground wire is needed. It is required to distinguish the ground wire and the neutral strictly.
- Input voltage value should be $\pm 5\%$.
- Rated input power frequency should be $\pm 1\%$.



Attention

If the voltage and current fluctuation surpass the prescribed requirement, it may cause damage for ultra-high pressure jet pump.

- Power capacity: 100KW(380MPa)
- Please refer to "electrical parts manual" for details.

3.7 Water Requirement

Intensifier needs two input water sources (cooling water and cutting water), and one drainage line for cooling water. All pipes must correspond with relevant local regulations and national standards.



Attention

Before pipeline connection, all the pipe fittings need to be well cleaned. It may cause the system pollution if they are dirty.



Attention

All pipelines shall be installed with a manual shut-off valve. For the convenience of maintenance and installation, the position of a manual shut-off valve should be arranged as close as possible to the connector.

3.7.1 Cutting Water

Input cutting water flows into the intensifier after filtration. Then cutting water will flow into the cutting head. Poor water quality may significantly reduce the service life of the component, and it does not enjoy rights which are listed in the warranty regulations.

Cutting water supply must meet minimum quality requirements. (Please refer to the appendix of "water quality standard")



Attention

The quality of cutting water is very important, because it directly affects the service life of the equipment. Low water quality can dramatically reduce the service life of parts.



Attention

The pump filters can only remove the large particles suspended in the water. It will not meet the requirement of our cutting water requirement. Water deionization system is required to increase the water quality.

- Only PVC pipe, steel pipe or rubber pipe connection can be used to deliver cutting water to the pump.
- Input water pressure should be bigger than 0.3 Mpa. If the water pressure is lower than 0.3 Mpa, a water booster pump is needed.
- Minimum inlet flow rate is 15.4 liters/minute.

3.7.2 Cooling Water

Input cooling water flows through the oil/water heat exchanger, in order to control the temperature of the hydraulic oil. Then the used water can be drained or collected and recycled

- Because the inside space of "oil/water heat exchanger (cooler)" is small, so the cooling water should be properly filtered. The filtering precision should not be higher than 5 μ m. Softened water can prolong the service life of heat exchanger and cooling effect.
- Cooling water temperature should be controlled under 35 °C, so that the cooling effect is guaranteed. If the external supply of cooling water temperature is too high, please use other proper cooling equipment.



Notice

The flow of cooling water should be at least 6 cubic per hour. If you cannot meet this requirement, an additional water pump is needed to increase the flow of cooling water.



Notice

If the cooling water is recycled, the total water in recycle system should be at least 3 cubic. If the cooling water is less than this, the cooling water temp will increase faster.

3.8 The Hydraulic Oil Requirement

Hydraulic oil is the blood of the ultra-high pressure pump. Use correct hydraulic oil is the basic guarantee of equipment operation. Unreasonable application will result in equipment damage and personal injury.

- Use No. 46 anti-wear hydraulic oil or the same level anti-wear hydraulic oil. Please use mineral oil series anti-wear hydraulic oil. Volume is 200L.
- Before fill the tank, it is required to filter the anti-wear hydraulic oil. Filtration precision should be at least 25 μ m.



Warning

Don't operate the hydraulic system if there is potential danger. This could cause serious accidents such as fire and explosive.



Attention

Hydraulic oil is flammable. So do not expose to open fire, or weld near the equipment. Otherwise it may cause a fire.



Attention

Please avoid splashing hydraulic oil to the people. Please wash thoroughly with soap if the hydraulic oil is on the skin. It may also harm the skin if hydraulic oil is splashed on the skin.



Attention

There is no anti-wear hydraulic oil in the pump, in order to prevent leak during transport and cause accident. It is required to fill anti-wear hydraulic oil before operation.

3.9 High Pressure Line

High pressure pipe is used for transporting cutting water from ultra-high pressure pump to the cutting head.

- Before installation, high pressure pipe should be well prepared. Ensure that the high pressure pipe is clean and free of oil. If high-pressure pipe needs to be bended, the bending radius should be more than 500 mm.
- When installing a high-pressure tube, it is required to clean up the threads of the tube and the fittings first. Make sure there are no sand and other dirt. Then grease the threads.



Warning

High pressure pipes and pipe fittings must have the right sizes. They are required to be provided by the A&V waterjet company.



Notice

Do not over tighten the high pressure fittings; otherwise it will shorten the service life of the high pressure pipe, or cause damage of the fittings and the tubes.

3.10 Controlling Cable

Controlling cable is used for remote control of ultra-high pressure pump. Through the remote controller it is easy to operate the pump automatically.

- Before the installation, the user should clean up the dirt on the connector, so as not to cause poor contact.
- After butt joint, lock the connection by rotate the fittings clockwise



Attention

Specifications of the connector pins are different; please make sure you connect it in the right way. If there is failure about the connection, there will be damage of the machine.

3.11 Recommended Tools

Prepare adjustable wrenches and Allen wrenches in different sizes.

Chapter Four: Debugging and Testing

4.1 Outline

After the high pressure pump is in place and all fittings and high pressure tubes are installed, the high pressure pump is ready for debugging and testing operation.



Notice

Check the environment around the equipment and make sure it is clean. Clean all the tools in this area and then prepare to start the equipment.

4.2 Power supply

Electricity needs to conform to the requirements of the "3.6 power requirement".

- Open all the external power supply breakers. Then use a multi meter to measure the power supply voltage before turn on the power.
- Turn on the main power switch on the ultra-high pressure pump. The oil temperature digital display should show the oil temperature at this moment.
- Release the E-stop button and the equipment power indicator should light up.
- Turn on and off the oil pump to see the rotation direction of the motor. The motor shaft rotation direction should be same as the arrow on oil pump. For related operation procedure, please refer to section 5 "operation".
- Turn off the power supply. Tighten all wiring of electrical box with the tools.



Warning

Cable connection and change of phase sequence should be done by professionals. All-Powerful company is not responsible for the completion of this work.

4.3 Cutting Water and Cooling Water

Operate the machine strictly according to "3.7 water requirements". Water quality must meet the required standards.

Input cutting water quality is one of the important factors that affect the service life of the components and properties. Impurities in water would lead to wear and corrosion of all the parts.

Cooling water needs to be filtered. Softened cooling water can prolong the service life of heat exchanger and increase the cooling effect.

- Before shut off all manual valves, put the inlet pipe off the intensifier.
- Open cooling water valve, making the cooling water circuit smoothly. Check whether the

flow of cooling water meets the requirements of the equipment.



Notice

When the oil/water heat exchanger (cooler) started to run, the water releases from the cooling water drain may not be clean. And it cannot be recycled. It should be released through sewer.

- Open the cutting water inlet valve a little. Therefore, make sure the water flow is small in order to release the air in the filter.
- The ultra-high pressure pump equipped with a water filter. Release the air in filter by pressing the red button on top of the filter.
- Fully open the cutting water inlet valve. Make the water flowing out from the intensifier inlet pipe for ten to fifteen minutes until the impurities and air in the feed line are all released.
- Turn on the water booster pump. The water flow rate of the intensifier inlet pipe will increase; Wait for five minutes and connect the intensifier inlet pipe back. Operation of low pressure water should refer to section 5 "operation".



Notice

All low-pressure water inlets should be installed with manual shut-off valve by the user. Ultra-high pressure pump has no low pressure inlet water shut-off valve.



Notice

If cut water and cooling water use the same water recycling source, the user should make sure that the cooling water circuit should not be polluted.



Notice

If there is softened water equipment in the system, clean it first. Ensure that it won't pollute the water.

4.4 The Hydraulic Oil System

Hydraulic oil should conform to the requirements of the hydraulic oil in "3.7".

- Press the stop button; shut off the power supply; turn down external power supply.
- Measure the hydraulic oil by liquid temperature meter in order to see whether it comply with the requirements for equipment operation. The minimum limit of hydraulic oil is 80 L.
- Remove the oil tube on the hydraulic oil pump.
- Pour hydraulic oil into the pump. Rotate motor shaft by hand to release the air in the pump.
- Due to transportation or installation, there may be loose of parts or components. Tighten all tubing joint and the fixed screw.



Notice

If the hydraulic oil level is too low, it could cause defective operation and fast rise of hydraulic oil temperature.

4.5 Test Run

In the process of transportation or installation, it may cause some loose of parts or components.

Tighten all loose components and parts especially the components in the high pressure part.

4.5.1 Operation Panel

- Check if the "oil pump" button, "high pressure" button and "stop" button are good or not. The operation method should accord with section 5 "operation".

4.5.2 Low Pressure Water System

- Run the pump; check the water pressure on the pressure gauge whether it can reach 0.5 Mpa.
- Check if the cooling water circuit is normal.
- Check whether there is leakage point in low pressure water systems.

4.5.3 The Hydraulic Oil System

- Run the oil pump motor for at least 15 minutes until the whole hydraulic system is completed with oil. The operation method should be according to section 5.
- Check whether there is a leakage in hydraulic fluid systems.

4.5.4 High Pressure Water Test

Install the on/off valve in the cutting head; keep the valve open during the test. Make sure the pump stop device operates normally before test.

The main purpose of high pressure water test is to remove impurities and build up the sealing system in order to make the high pressure sealing device works in a good condition.

In the testing process, it may damage the water on/off valve and orifice. But do not be worried. The machine comes with extra accessories so that it can be replaced in order to guarantee the normal running of the machine.

- Tear down cutting head and prepare for impurities removal process.
- In order to avoid a sudden increase of pressure and a damage of sealing device, it is

needed to adjust the hydraulic oil overflow valve in order to reduce the cutting water pressure. Turn the valve counter clockwise in two circles.

- Turn on the water booster pump. Wait until water comes out from the cutting head. Then stop the water booster pump.
- Start the oil pump; wait for 3 seconds until intensifier finishes shifting. Press high pressure button and let high pressure water flowing out for 5 min. Then press stop button and stop the pump. In this process, the piston in the intensifier will be shifting in high speed. This is normal. Please don't worry.
- Put on the cutting head and the nozzle. Start the pump and wait for 3 seconds until intensifier finishes shifting. Slowly adjust the hydraulic oil overflow valve clockwise to increase the pressure. Then there will be high pressure water flows out from the cutting head. Keep the pressure for 2 minutes. Check the cutting head and various joint to see there is leakage or not.



Notice

Though the water seems not strong, please don't make your hand or body contact with the water stream, otherwise it may cause personal injury.

- Adjust the hydraulic oil overflow valve clockwise, and then observe the oil pressure gauge. Increase the oil pressure 1 Mpa, and wait for 2 minutes. Please check the cutting head and various joint whether there is leakage.
- Increase the pressure according to the method above. The pressure should be increased 1 Mpa each time and wait for 2 minute. Check the cutting head and various joint whether there is leakage.



Notice

In the process of pressure increasing, it may discharge extra fragments from the cutting head. This may damage the high pressure components such as orifice and nozzle. We will need to discharge all the dirt in the system.

- Adjust pressure to 15 Mpa. Let the pump runs 1 to 2 hours continuously. At run time, please check all the system conditions, such as whether there is any abnormal sound, whether there is any oil spill and leak point and so on.
- If no problem, we can turn it off. Then tighten high pressure components with the wrench once more.



Notice

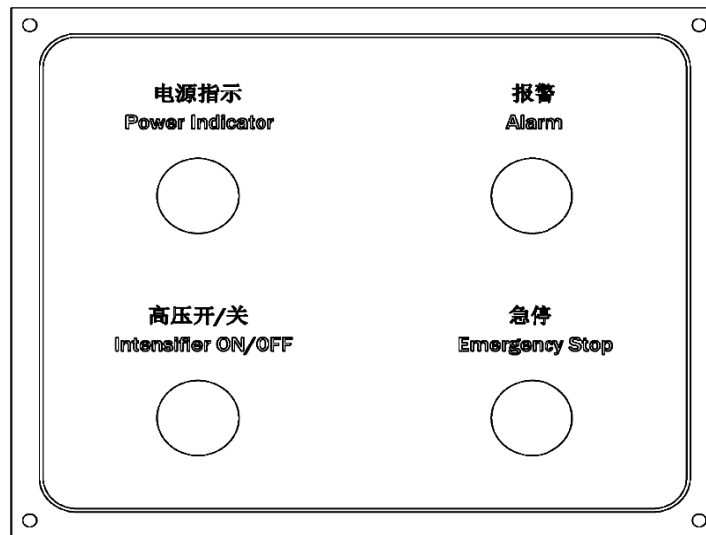
We strongly recommend that please make sure the ultra high pressure pump has enough test running time. Then the high pressure pipeline should be cleaned up. Otherwise the nozzle would be worn out soon.

Chapter Five: Operation

5.1 Outline

This section summarizes the operation of the control panel, startup and shutdown sequence. These operations are often used in equipment debugging and maintenance. If you need to open and close automatically, it needs to connect with a control system, such as CNC, PLC, etc.

5.2 Control Panel



A12X2 control panel

5.3 The Introduction of Panel Function

- **Power indicator**
Turn on the power supply, and release all the E-stop buttons. The indicator lights up in red. It indicates that the extra-high pressure pump can be operated.
Remote E-stop refers to the device that installed the remote system.
- **Alarm**
When the alarm light is up (red), it means the oil filter of high pressure pump is jammed or damaged. The indicator alarm will not light up when it normally works. If it lights up, the oil pump electric unit will stop working.
- **Intensifier On/Off (High pressure On/Off)**
Press this button for high pressure turn on. And the button will light up into green. Press the button again; high pressure would be closed, at the same time indicator light is off.
When the button is pressed, it is actually provide electricity to many relative components, such as electro-hydraulic directional control valve, solenoid relief valve and

pump. So when the oil pump motor is running, you can only hear the sound of water booster pump when press the button of high pressure.

During the testing and trial operation, we can only run the pumps by pressing the high pressure switch button, in order to achieve our debugging and testing purposes.

- **Emergency Stop Button**

We can press the button when there is accident and emergency during the operation. After press this button, the relevant power supply will be cut off, including the oil pump motor. The water pump motor and the power indicator light will also go out.

After press the button, the machine will be automatically locked, and it will not bounce reset. If this button needs to reset, please refer to the direction arrow on the button.

5.4 Startup and Shutdown Sequence

Before cutting, we need to start the pump up. After the cutting work is done, we need to turn the pump off. The following instruction shows the startup and shutdown sequence.

- **Startup**

Open the external general power circuit breaker.

Open the pump power supply.

Reset the E-stop button of the high pressure pump.

Open the cutting water and cooling water inlet valve.

- **Shutdown**

Close the cutting water and cooling water inlet valve.

Press the E-stop button of the high pressure pump.

Close the pump power supply.

Shut off external general power circuit breaker.

5.5 High Pressure Water Startup and Shutdown Sequence

Either through the control panel or CNC control system, the start and shutdown of high pressure water should follow the following order and principles.

- **Startup**

Start up according to "section 5.4".

Press oil pump switch to start the oil pump main motor.

Open the on/off valve on the cutting head.

Start up the high pressure water by pressing the "intensifier on/off".



When the "high pressure on/off" button lights up, do not run the oil pump motor, otherwise it will damage motor and oil pump.

Notice

- **Shutdown**

Close the high-pressure water by pressing the "intensifier on/off".

Close the on/off valve on the cutting head.

Stop oil pump main motor by pressing the "oil pump on/off".



Notice

Please pay attention to the open and close status of the on/off valve on the cutting head. Make sure the valve is open before turn on high pressure water. If the valve is closed, a sudden rise of pressure may damage the valve.

Chapter Six: Low Pressure Water System

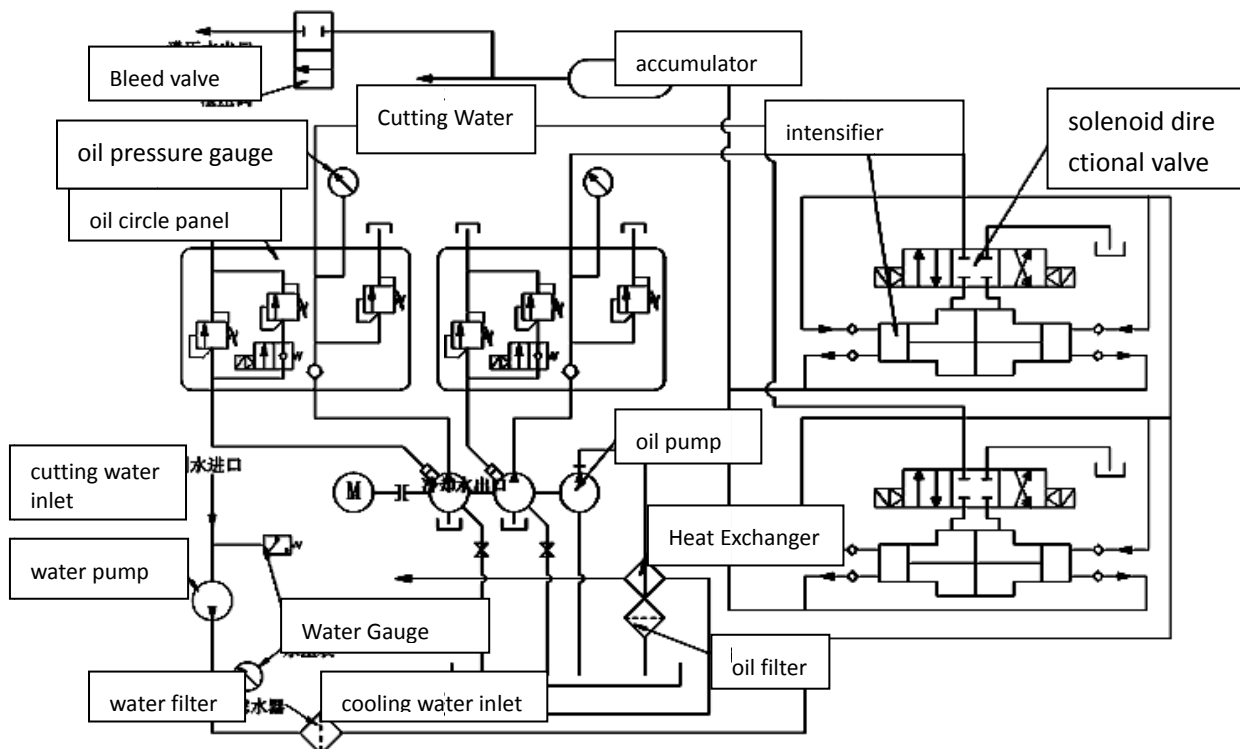
6.1 Outline

Low pressure water system consists of cutting water inlet system and cooling water inlet system. This section will show the details.

Cutting water inlet system provides cutting water flow and pressure to the intensifier. The low pressure inlet water system components include input water filter components and booster pump. Connected to the PLC with the pressure switches and temperature switches, it can monitor the inlet cutting water condition. If it goes beyond the inlet water requirements, it will shutdown the pump automatically.

Input cooling water flows through the oil/water heat exchanger (cooler) in order to control the temperature of the hydraulic oil. Then the cooling water flows out from the cooling water outlet into the drain or into a customer to provide water cooler. This path make up to the chilling circulation.

6.2 Low Pressure Water System Schematic Diagram





6.3 The Requirement of Cutting Water

Consumption Peak	15.4L/min
The Minimum Inlet Pressure	0.3MPa
The Best Inlet Water Temperature	18°C
The Highest inlet Water Temperature	29°C

6.4 The Requirement of Cooling Water

Consumption Peak	35L/min
Minimum Working Oil Temperature	15°C
Best Working Oil Temperature	46°C
The Minimum Inlet Pressure	0.25MPa
The Highest Water Pressure	0.75MPa

Chapter Seven: Hydraulic System

7.1 Outline

The main hydraulic system provides hydraulic oil to intensifier to generate high pressure water. This chapter is mainly describing the working principle, components and maintenance procedures of the major hydraulic system.

7.2 The Working Principle of the Hydraulic System

The motor drives the hydraulic oil pump through a flexible coupling. The whole parts are what we call oil pump assemble. Oil pump assemble extracts the filtered hydraulic oil from the oil tank. Hydraulic oil comes through the inlet side of pump assemble, and flows to the pipeline system through a check valve after pressurized in the pump.

After the hydraulic oil passing through the check valve, it is divided into two branches. One goes through check valve to accumulator and the other one goes to valve plate. Accumulator is used to stable the oil pressure in the system.

Intensifier oil cylinder, solenoid overflow valves, electro-hydraulic directional control valve, seismic oil pressure gauge, pressure relay and oil return pipe are connected on the valve plate. The oil return pipe is connected to the heat exchange. Hydraulic oil flows back to oil tank after flows through the heat exchange.

The pressure relay monitors the hydraulic oil pressure through the main pressure system, thus protect the hydraulic oil system. If the pressure of hydraulic oil surpass the rated pressure, the system would stop the oil pump assemble.



Notice

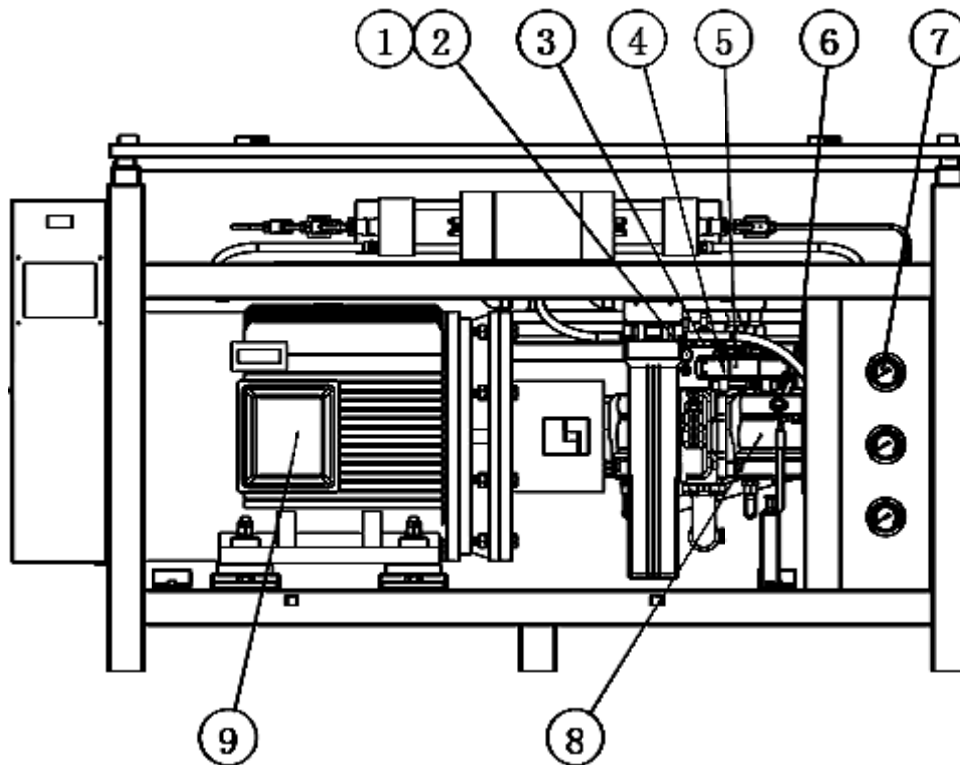
The pressure relay of our equipment is corrected by the factory. It is not allowed to repair this relay personally.

When we only run the oil pump power assemble, the hydraulic oil goes back into the tank via solenoid relief valve, heat exchangers. There is no pressure in the main hydraulic system. Electrical hydraulic directional valve is not working. The piston in the intensifier is not moving.

After the pump electrical assemble runs and high pressure button is pressed, the solenoid overflow runs, and the hydraulic oil pressure is controlled by solenoid relief valve. Meanwhile, electro-hydraulic directional control valve works, and it will import the hydraulic oil pressure on one end. Then hydraulic oil will return to the intensifier on the other side of the cylinder, making the intensifier tank operates the stroke movement. The released hydraulic oil goes through the oil tank through heater exchange.

When the piston is pushed to the intensifier oil cylinder on end, it will trigger the switch on the end. Then the switch will send a signal to PLC, which controls electro-hydraulic valve to make a movement. So do the stroke movement repeatedly, the piston impact program exercises over and over again.

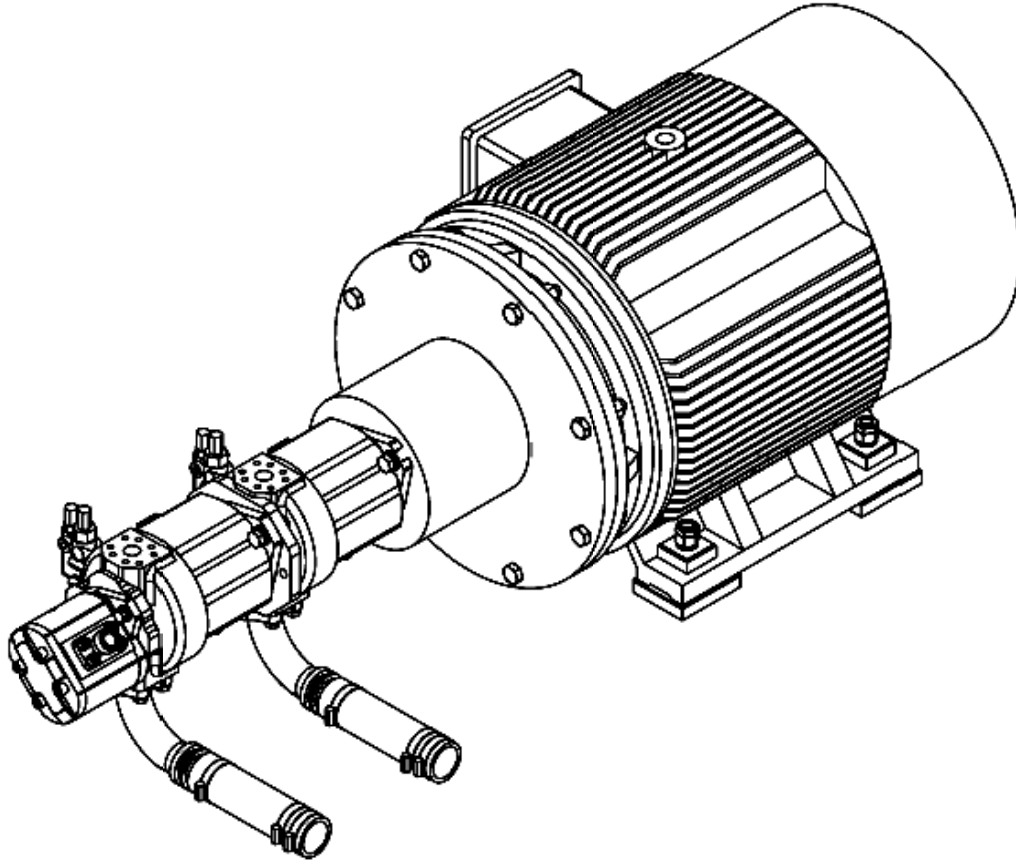
7.3 The Composition of the Hydraulic System



The composition of the A12X2

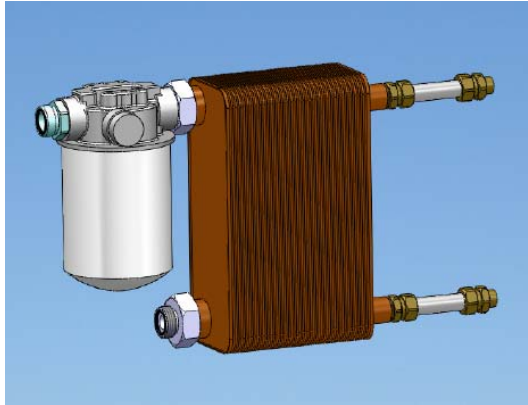
- | | |
|---|-----------------------|
| 1. Low pressure control valve | 6. Valve plate |
| 2. High pressure control valve | 7. Oil pressure gauge |
| 3. Solenoid directional valve | 8. Hydraulic pump |
| 4. The system pressure relief valve | 9. Electrical machine |
| 5. High and low pressure solenoid valve | |

7.3.1 Motor and Hydraulic Pump Assembly

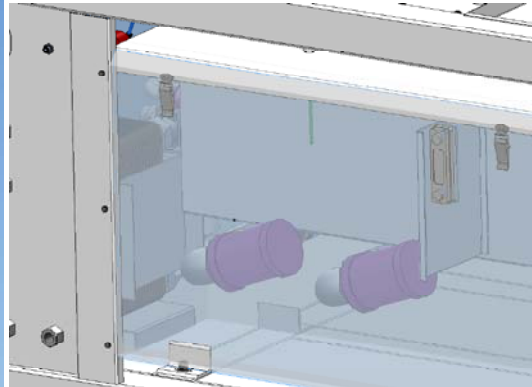


The motor drives the hydraulic oil pump through a flexible coupling. The whole parts are what we call oil pump assemble. Oil pump assemble extracts the filtered hydraulic oil from the oil tank. Hydraulic oil comes through the inlet side of pump assemble, and flows to the pipeline system through a check valve after pressurized in the pump.

7.3.2 Oil Filter



A12X2 Oil Filter



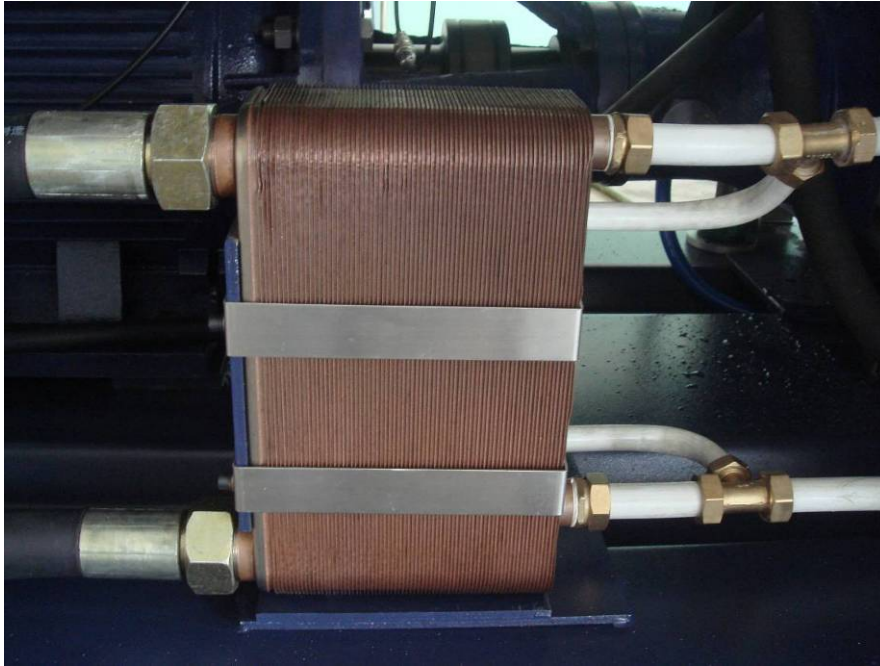
A12X2 Oil Filter

7.3.3 The Pressure Gauge



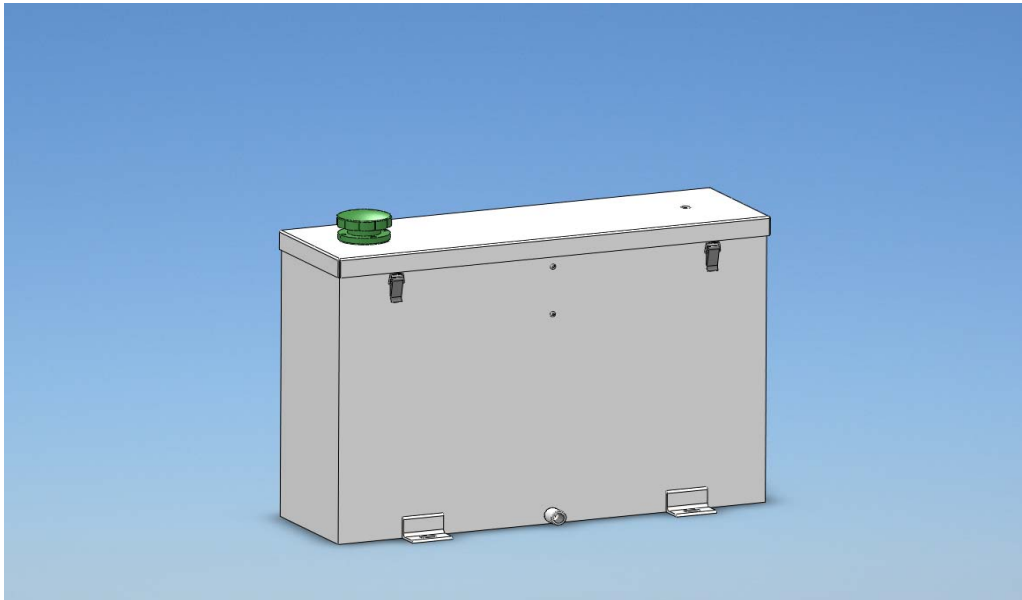
Oil pressure gauge displays the oil working pressure. It also shows the water cutting pressure. Because the ratio is 20:1, so when the gauge shows 16mpa, the pressure of water is 320mpa. When the piston is moving, the gauge indicator will swing in the set up range.

7.3.4 The Heat Exchanger



Heat exchanger is cooling the oil by water.

7.3.5 Oil Tank



A ventilation device and a filter are installed at the top of the tank. When the hydraulic fluid level decreases, the air will enter into the storage tank. When the hydraulic fluid level rises, the air flows out of the tank. The ventilation device can prevent dirt from entering into the storage tank. The ventilation device should not be used as an injection point. The

hydraulic oil must be released and changed through the oiling point on the top of the filter.

7.4 Hydraulic Oil

The medium of ultrahigh pressure pump power is hydraulic oil. The right choice of hydraulic oil and the right use of the machine is the basic guarantee of equipment operation. Incorrect application will result in equipment damage and personal injury.

7.4.1 The choice of Hydraulic Oil

Please use #46 anti-wear hydraulic oil or same level anti-wear hydraulic oil. For details, please see "3.8 The Hydraulic Oil Requirement".

7.4.2 Filling the Hydraulic Oil

The hydraulic oil should be filled into the fuel tank through the filling port.

7.4.3 Assess the Hydraulic Oil

The hydraulic oil needs to be replaced after using or getting polluted. Oil quality can be evaluated through appearance or smell or accurate assessment conducted by oil dealers.

The high pressure water in the intensifier may flow into the oil. Serious leakage may cause water flow into the oil cylinder through piston rod seal. If the oil surface looks white, it means there is water in the oil. It will damage the pump. So the pump needs to be shut down immediately. Release all the hydraulic; clean spare parts; replace oil; replace the seal end cover and the piston rod seal.

If oil pump works in the high oil temperature for a long time, it will reduce the service life of oil. Oil temperature should be under 50 °C but not lower than 10 °C. It is needed to stop the machine when temperature goes higher than 55 °C. You can start to work again when the temperature goes down.

New oil is clean. After high temperature operation, the oil turns dark and smells bad. When oil becomes thick and black with a bad smell, it needs to be replaced. When the oil is changed, the filter should be changed as well.

7.5 Maintenance and Inspection

Hydraulic system requires extreme circulation working conditions, which makes daily check and maintenance work particularly important. Oil filter and hydraulic oil need to be regularly checked to see if they meet the requirements.

In addition, it is needed to check whether there is leak in the main hydraulic system. If there is, please repair it immediately.



7.5.1 The Maintenance of the Filter Cartridge

Take return oil filter cartridge as an example.

- a. Return oil filter is installed on the oil tank, which is near the end of the motor. See "7.4.2 oil filter".
- b. Open the cover of the oil filter.
- c. Take out oil filter cartridge.
- d. Soak in Kerosene for 15 minutes.
- E. Clean the filter with brush, and then blow it dry.
- f. Repeat d - e steps 3-5 times, and make sure it is well cleaned.
- g. Blow dry after the filter is clean. Install it back into the oil filter.
- h. Put the o-ring on and tighten the cover

7.5.2 The Replacement Procedure of the Hydraulic Oil

- a. Release the oil through the outlet.
- b. Remove the screw on the back of oil tank. Take the back cover off.
- c. Clean fuel tank inside with kerosene. Then wipe inside the tank with a clean cloth.
- d. Install the back cover of the oil tank.
- e. Prepare 200L of #46L anti-wear hydraulic oil.
- f. Fill hydraulic oil through the filling point.

7.5.3 The Maintenance of the Machine

After using for 500 hours or three months, the motor needs to be checked up. Motor should be kept clean. The ventilation holes should be free of wind.

Chapter Eight: Electrical System

8.1 Outline

The major parts of A12X2 electrical system include the motor, the sensor and solenoid valve and connecting cables.

8.2 Sensor and Solenoid Valve

The sensors monitor the working situation. The electronic control solenoid valve provides basic switch control functions to the intensifier. All the cable connecting the sensor and solenoid valve are tied together.

1. Temperature sensor

When the oil temperature goes over 55 °C, it should be manually shut down.

2. right/left approach switch

When the high pressure oil was sent to the hydraulic cylinder on one side, it pushes the piston to one side and activates the approach switch on the end. Then the high pressure oil will be sent to the hydraulic cylinder on the other side and push the piston to the other side. It will trigger the switch on the other end.

When the piston touched the signal rod No.1, the switch is activated. Then the signal is sent to the magnet on the magnet base. After the switch is triggered, it will send signal to the controller in order to change the direction of direction valve and makes an opposite movement.

3. Directional Solenoid Valve

Two four-way directional solenoid valves make the hydraulic oil flow into or out of the intensifier in different direction. Guided by a reversing valve of hydraulic oil flow on one end of the hydraulic cylinder, the hydraulic oil flows from cylinder to the oil tank, so that the intensifier can make a stroke movement. This movement is controlled by a pilot valve. Pilot valve is electronically controlled by two electromagnets manipulation.

4. Low water pressure sensor

When inlet cutting water pressure is below 0.3 Mpa, high-pressure pump cannot be started.

5. The hydraulic oil pressure sensor.

When the hydraulic system pressure exceeds the setting hydraulic oil pressure sensor, the high pressure pump automatically stops.

6. High/low pressure solenoid valve (A12X2)

High and low pressure switch.

8.3 Maintenance Procedure

All the electrical components don't need much maintenance. Proximity switch on the hydraulic cylinder may need to be replaced.

If the state of the approach switch in the PLC input point does not change (not triggered by the piston), it means the switch is failed, and needs to be replaced.



Chapter Nine: High Pressure Water System

9.1 Outline

This section shows the working principle of ultra- high pressure pump and the replacement of the spare parts.

9.2 Working Principle

The medium of Intensifier system is hydraulic oil and water. The middle part is the hydraulic oil system. The left and right sides are water system. There is piston in the oil cylinder. The piston is connected by two rods on both sides. The piston cylinder is divided into two pieces. When it works, the hydraulic oil from driving system pushes the piston to the other side and meanwhile it makes the piston work in the high pressure cylinder, squeezing the water out of the high pressure cylinder. Since the cross sectional area of oil cylinder is 20 times of piston cross sectional area of high pressure tank, the pressure ratio is 1:20. Therefore, in the intensifier working system, it realizes the way of pressurizing water by pressurize hydraulic oil.

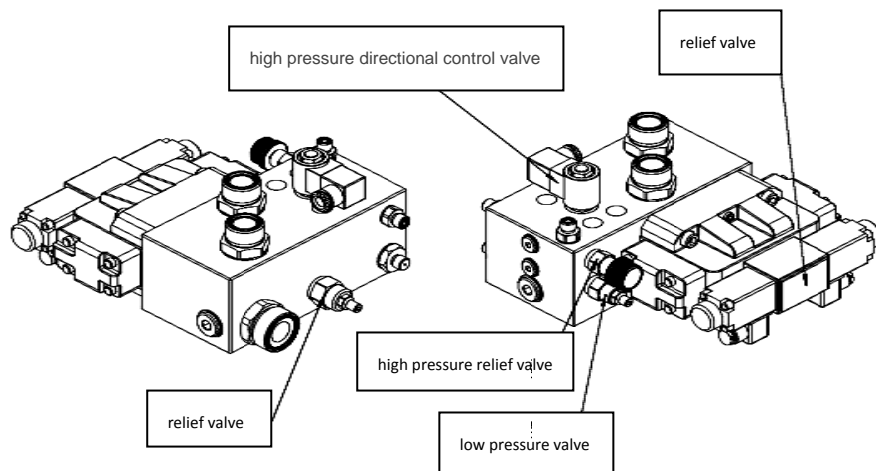
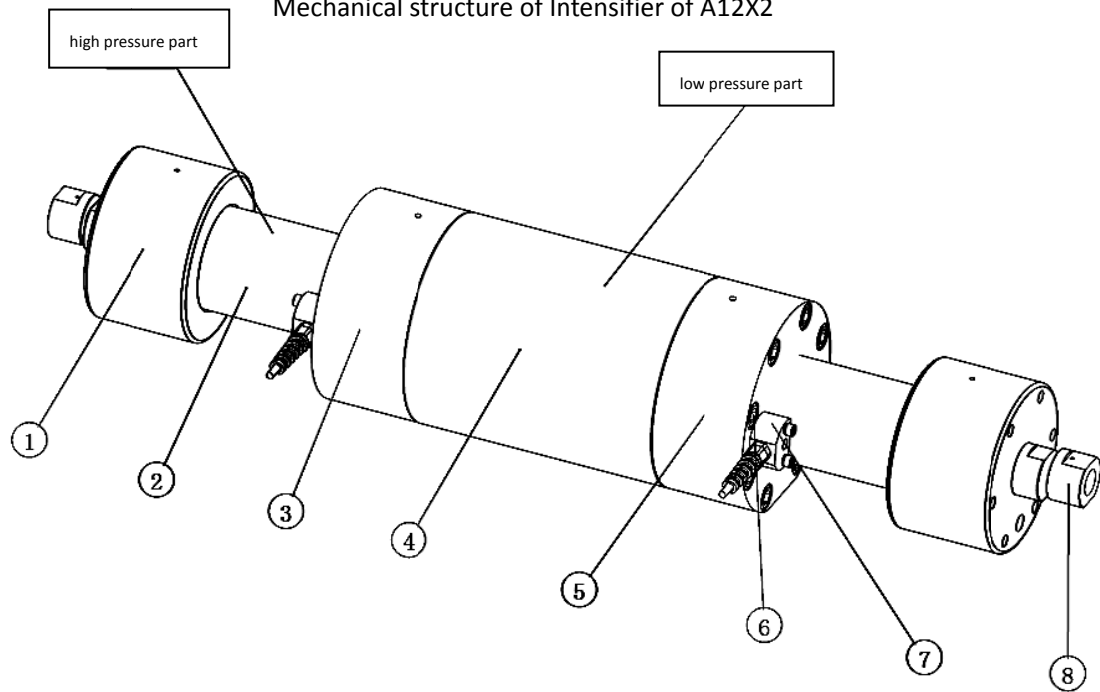
After the water is pressurized, it flows into cutting system. The check valve makes the water flow in one direction. The ratio of the oil pressure and the water pressure is 1:20. So the oil pressure decides the water pressure. Therefore, the water pressure is controlled by adjusting the oil relief valve. When the piston moves to the end of the oil tank, the magnet switch sends the signal to solenoid directional valve. The signal makes the hydraulic oil flow to the other side of the oil tank. After the piston works like this for several times, it produces the water with stable pressure. But, if the piston works on the opposite side, there will be a temporary cease. At this time, there will be a big loss of pressure for water. But we can compensate this loss by using accumulator.

9.3 The Mechanical Structure of the Intensifier

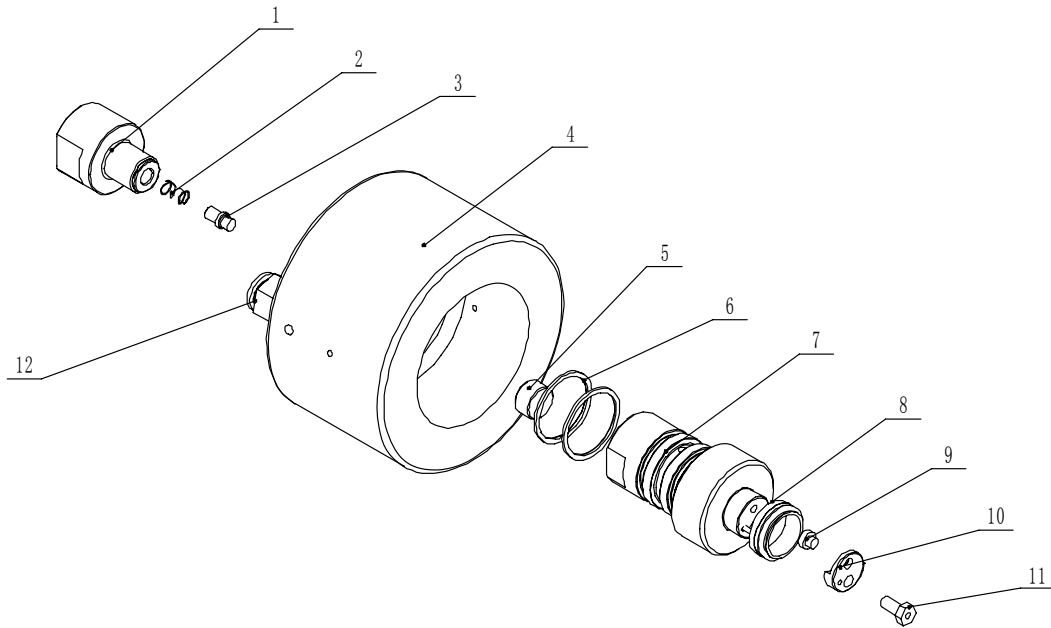
The intensifier is consisted of high pressure part, low pressure part, cover, and sensor.

1	End cap	110-20047-0102	7	sensor	
2	High pressure cylinder		8	check valve	110-20076-0101
3	Left nut	110-20048-0102			
4	Hydro-cylinder	110-20030-0102			
5	Right nut	110-20049-0101			
6	socket head cap screw	204-01280-10			

Mechanical structure of Intensifier of A12X2

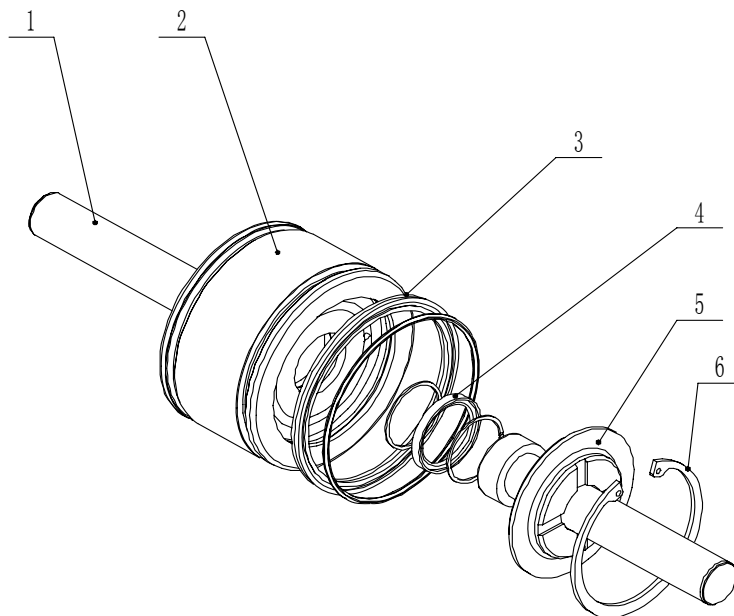


1	H/P check valve	110-20076-0101	7	Check valve body	110-20081-0101
2	Check valve spring	110-20084-0101	8	High pressure ring components	
3	Outlet poppet	110-20075-0101	9	Inlet poppet	110-20003-0101
4	End nut	110-20047-0101	10	Cover of chock plug	110-20077-0101
5	Insert	110-20074-0101	11	Screw	110-20050-0101
6	Valve O ring	210-07335-10	12	Fitting	205-31214-0101



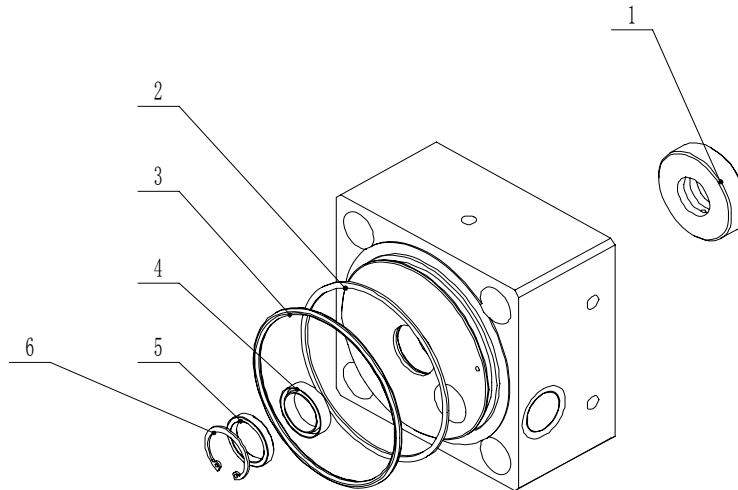
9.3.1 The Structure of Low Pressure

1	Piston rod	110-20004-0101	4	T ring components	
2	Piston	110-20053-0101	5	Piston rod gland	110-20052-0101
3	Piston seal	206-12021-01	6	Jump ring	202-89378-02



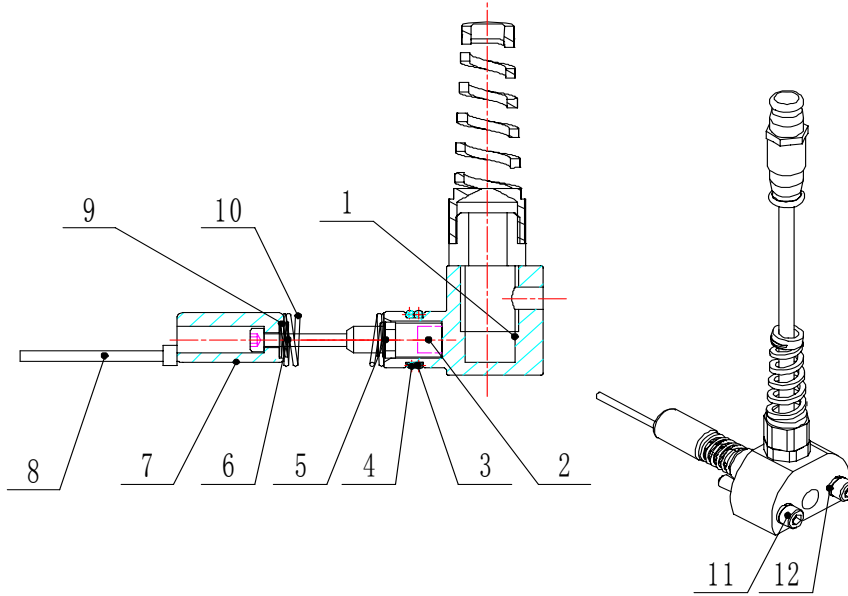
9.3.2 The Structure of End Cap

1	Seal ring	110-20039-0101	4	u-ring	206-12100-01
2	Oil cylinder Ring	110-20031-0101	5	cover	110-20040-0101
3	Valve O-ring	210-08925-10	6	Jump ring	202-89334-01



9.3.3 The Structure of Sensor

1	Sensor	110-21004-0101	7	Signal the push rod	110-20033-0101
2	Magnetic patch	110-20002-0101	8	Signal rod	110-20032-0101
3	Signal tube block valve	110-20037-0101	9	Fine compression spring	110-20035-0101
4	O- ring	210-06095-10	10	Coarse compression spring	110-20036-0101
5	Magnetic basis	110-20034-0101	11	Hexagon socket head cap screw	204-00530-01
6	hexagonal socket M3	204-00330-01	12	Spring washer	202-09305-01





Chapter Ten: Maintenance and Repairing

10.1 Outline

This section lists the periodic preventive maintenance procedures, which ensures high pressure pump works in a good condition. It contains information about high pressure pump malfunction diagnosis and the maintenance requirements.

10.2 High Pressure Tube

Notice:

1. It is needed to prepare and bend the high pressure tube before installation. Bending radius should not be too small.
2. When install a high-pressure nut, it is required to clean the threads first. There can't be sand and other dirt on it. Then put some blue goop on it.
3. When tighten the high-pressure nut, don't make it too tight, otherwise it will reduce the life of the high pressure pipe, and seriously damage the high pressure tube.

FAQ

1. Check if there is leakage in connection place.
Tighten screw or high pressure nut first. If it is not solved, please check the high pressure pipe sealing cone to see whether it is damaged or the sealing surface is damaged. Replace the corresponding parts.
2. Broken of high pressure tube.
Replace it when the tube is broken.

10.3 Check Valve (High Pressure)

Notice:

1. High pressure outlet poppet cannot be reversed.
2. The valve should be cleaned up when it is installed. And it also needs to be lubricated with oil.

Common malfunction:

1. Water leaking from the observing holes.
First, tighten the high pressure screw. Second, check the sealing surface of the high pressure tube.
2. Pressure failure and pressure unstable:
Please see the solution in the next section.



10.4 High Pressure Cylinder Check Valve Body

Notice:

1. Make sure the high pressure outlet poppet is aligned when install the check valve body.
2. Using oil to lub the surface of high pressure seal when install it.

Common malfunction:

1. Water leaking from the observing holes:

It is mainly the problem of the seals in the check valve body. First, tighten the high pressure check valve; second, check the outlet poppet; third, check the high pressure check valve sealing surface; last, check the high pressure cylinder sealing surface.

2. Pressure failure and pressure unstable:

First, check whether the low pressure water is sufficient. (Pressure and flow rate)

Second, check the solenoid switch by following steps:

First see which side of the solenoid switch indicators light on, when the oil pressure gauge shows zero. It means there is problem in high pressure check valve on the same side of the light and in low pressure check valve on the opposite side. If it is the problem of high pressure check valve, you can polish the sealing surface of the outlet poppet and the check valve body. If it is the problem of low pressure, please polish the outlet and poppet on the surface. Please polish with sand paper with 1000 mesh and 2000 mesh, and polish in “8” shape or “L” shape.

3. Check valve body cover loose:

It is mainly because the screw is loosening, when the poppet and seat are not well fitting with each other. Please make sure to tighten the screws during installation.

10.5 High Pressure Cylinder

Notice:

1. Use the correct tool to remove the cylinder.
2. Before installation, lubricate all the parts.
3. The surface of the high pressure seal should be lubricated during installation.
4. Pay attention to the direction of the high pressure seal. The O-ring should be installed inside.

FAQ

If the end cap of high-pressure cylinder and end cover of oil cylinder leak, replace the high pressure seal on the relative location.

10.6 Oil Cylinder and Piston

Notice:

1. Install the sealing ring assemblies on the piston correctly.
2. Carefully clean every spare part before and after the installation

3. The piston is made of high hardness material. So the toughness is low. Please don't bump against it.
4. Please use oil to lubricate the surface.

Problem:

1. Piston is not changing direction.

First, the high-pressure water flow path may be blocked. Check the water nozzle, high pressure filter, high pressure tube and high pressure valve core, and see whether they are stuck. Second, check whether there is a problem in the sensor and the magnetic switch. See if the magnetic switch is damaged, or the spring and the magnet are damaged. Third, check the electro-hydraulic directional control valve and solenoid overflow whether there is a problem, such as the electromagnet get stuck. Fourth, check if it is the problem of the electricity. You can adjust the switch by hand. If the intensifier can reverse, it means the problem is on electrical side.

2. Large amounts of oil spill in oil cylinder
Replace the Y-shaped sealing ring in the cylinder end cover.
3. Leak between the cylinder cover and cylinder oil tank
Replace the o-rings of the oil cylinder.

10.7 Accumulator

FAQ

1. Accumulator seal leaking

Replace the accumulator.

10.8 Precautions of the Intensifier Dismounting

Notice:

1. Prepare clean cloth, air gun and kerosene for cleaning. The working platform must be flat and clean.
2. Clean the surface of intensifier. And then take them apart.
3. Fix the intensifier on the working platform. Disassemble the broken accessories.
4. Clean the removed accessories by kerosene. It is important to check whether there is any damage on thread. If it is, please use sandpaper or abrasive stick to fix it.
5. Please make sure to keep the thread clean during installation. And then, use the special black glue from our company.
6. If install a new accessory, clean it first, especially on the sealing face. Check the thread carefully. Check the sealing surface and the screw. And then use the special black glue in thread. It is an important means of protecting thread.
7. If it is hard to disassemble, you can use rubber hammer to knock the wrench and vibrate the thread. Then it is much easier to take it apart.

Chapter Eleven: Technical Specifications

11.1 Outline

In this chapter the standard form of A12x2 high pressure producer is provided.

A&V A12X2 water jet system

Motor power		Max. working pressure	Max flow (pressure in full)	Max nozzle diameter (pressure in full)
HP	KW			
100	75	410MPa	5.42L/min	0.42

11.2 Installation Specification

Environment

Installation site	indoor
Dust/atmospheric pollutants	minimum
Environment temperature	
Minimum storage temperature	2℃
Minimum operating temperature	5℃
Maximum working temperature	40℃
Maximum relative humidity (the highest working temperature)	95%

Note: When relative humidity higher than 50%, check the water content of the medium oil tank.

Plant air

The connection of plant air should be provided with clean dry air with 6kgf/cm²

ISO Air Quality Classification

ISO air quality classification	Largest particle size (micron)	Max. pressure dew point (water in kgf/cm ²)	Max.oil content (Mg/m ³)
1	0.1	-60℃	0.01
2	1	-40℃	0.1
3	5	-4℃	1
4	15	38℃	5
5	40	45℃	25
6	--	50℃	--



11.3 The Standard of Water

Consumption peak	15.4L/min
Minimum inlet water pressure	0.35 kgf/cm ²
Maximum inlet water pressure	0.65 kgf/cm ²
The best water temperature	18°C
The highest water temperature	29°C
Water inlet low pressure alarm	0.3 kgf/cm ²

24°C consumption peak	35L/min
Minimum working oil temperature	15°C
Best working oil temperature	46°C
The highest working oil temperature	62°C
Lowest cooling water inlet pressure	0.35 kgf/cm ²
Highest cooling water inlet pressure	0.65 kgf/cm ²

Water quality standard

The quality of cutting water is one of the most important factors for the life span of spare parts and its character. Water treatment can be confirmed by analyzing the water quality.

Cutting water must satisfy the following criteria. A high concentration of soluble solid (especially calcium, silica and chloride) will affect the service life of the high pressure components.

Water quality standard			
component (mg/L)	Minimum requirement	preferably	best
basically	50	25	10
calcium	25	5	0.5
carbon dioxide	0	0	0
chloride	100	15	1
free chlorine	1	1	0.05
Iron	0.2	0.1	0.01
Magnesium	0.5	0.1	0.1
nitrate	0.1	0.1	0.1
oxygen	25	25	10
silica	2	1	0.1
	15	10	1
sodium	50	10	1



Water quality standard			
component (mg/L)	Minimum requirement	preferably	best
sulfate	25	25	1
TDS*	200	100	5
total hardness	25	10	1
pH	6.5-8.5	6.5-8.5	6.5-8.5
turbidity (NTU)	5	5	1

Note: Quality of dissolved solids (TDS)

TDS reduction shall not be less than this value; otherwise the water would have aggressive.

The water contains impurities

component	chemical formula	remark
basicity	bicarbonate (HCO ₃)	Water ability of acid neutralization. Solid foam and entrainment. It would result in steel brittle, CO2 emissions. It belongs to a source of corrosion.
	carbonate (CO ₃)	
	hydroxide(OH)	
calcium	Ca	Harden the water when Dissolve it so that it could produce form scale.
carbon dioxide	CO ₂	Lead to corrosion
chloride	Cl	Increase the solid content and enhance the corrosion of water. When there is proportional to oxygen, it can cause stress Corrosion cracking.
free chlorine	Cl ₂	Antioxidant: Erode rubber seals, and make its failure
iron	Fe ²⁺	Discoloring the water or sediment: scale and erosion in the source.
	Fe ³⁺	
magnesium	Mg	Harden water when it is dissolved, and make into scale.
manganese	Mn ²⁺	Discoloring the water or sediment: the source of scale and erosion.
nitrate	NO ₃	Increase the solid content: effects on industry is not obvious
oxygen	O ₂	Lead to corrosion

silica	Si O ₂	Scale
sodium	Na	Natural found: in the ion exchange water softening technology was introduced into the water.
sulfate	SO ₄ ²⁻	Increase the solid content. It forms scale when combined with calcium.
TDS		Measure of total water soluble materials.
total hardness	CaCO ₃	The hardness components; It is usually identified as calcium carbonate relative concentration; It mainly attributed to the solution of calcium and magnesium, and a little amount of metal.
pH		The acidic or alkaline strength of the water; pH(from 0 to 14) 0 means strong acid; 14, strong alkaline; 7, neutral

11.4 The Size and the weight of the Equipment

The size and the weight of the equipment

model	Length(A)mm	width(B)mm	height(C)mm	Weight(Kg)
A12X2	2100	1245	1165	1700

11.5 Electrical Specification

Electric System

Motor type	Totally enclosed fan cooled type
Control device	
Voltage	DC24V
Current	5A

Ampere capacity and voltage requirements

Supply voltage	Motor capacity	Full-load current(A)	Current circuit breaker(A)
480V three phase 50Hz	75KW/100HP	140	200



11.6 The Specification of the Hydraulic Pressure and High Pressure System

Hydraulic system

MWP	20MPa
The main relief valve pressure system	20MPa(A10) 21.5MPa (A12X2)

High pressure system

Max flow(410MPa)	5.42L/min
Supercharge ratio	20:1
Minimum water pressure	70MPa
Maximum water pressure	410MPa



Common Trouble Shooting Guide

Symptom	Cause	Solution
Oil pump noise	Suction filter clogging	Clean or replace new oil filter core
	Oil viscosity is too high	Using the calibration of hydraulic oil according to the season
	Tank airtight	Clean air filter tank
	Tank level is too low	Adding oil to the max. level gauge
There is foam in the oil	Suction tubing leakage	Change a new pipe
	Pump shaft seal leakage	Change the sealing ring
Too much heat in oil pump	Wear or damage of pump	Repair or update
	Oil viscosity is too low, too high or bad	Use the recommended hydraulic oil or change new oil
The noise of the overflow noise	Damage of spring and valve core or block of mud hole	Replace damaged parts or cleaning
The oil temperature is tool high	Relief valve discharge flow rate is too high	Reduce overflow traffic to matching with high pressure
The intensifier is not reversing	Electric reversing valve is struck	Clean the valve core
	Electric reversing valve receive no signal	②Shoot the trouble, and make receiving valve receive the signal
No pressure from hydraulic system	Solenoid relief valve core were stuck by other things or receive no signal	Cleaning the overflow valve or restoring electrical signals
	Oil filter door didn't open	Open the oil filter door
Hydraulic system not unloading	The overflow valve electromagnet no signal or stuck valve core	Shoot trouble and make electromagnet received signals or cleaning the overflow valve

Hydraulic pendulum wing when reversing	Pump flow mismatch or throttle valve haven't adjusted rightly.	Turn up the pump flow or adjust the double-one way throttle valve
Reversing speed is different	The throttle valve is not adjusted correctly	Adjust the throttle valve
The supercharge is not reversing	Energy converter plug	Clean or replace
Noise in accumulator	Small buffer resistance pressure	Adjust throttle and eliminate the crushing
High pressure water head divergence	Energy converter damage or clog	Replace or clean up
No high pressure water	Energy converter plug(pressure is normal)	Clean or replace
	③no water supply from low pressure water pump	Trouble clearing
High pressure system pressure drop	High pressure	Check the high pressure pipe joint and eliminate leakage
	Hydraulic system pressure drop or don't match	Eliminate hydraulic system pressure drop reason or higher hydraulic pressure
	Hydraulic pump flow rate does not match	Raise the hydraulic pump flow to match the high pressure system
	Check valve leakage (surface is hot)	Repair or replace the hot check valve



A12X2 Alarm Instruction of High Pressure Pump

A12X2 high pressure pump is the latest hi-tech products of A&V water jet. The alarm instruction is as below:

On the A12X2 high-pressure pump control panel, there is a red alarm indicator (2 hl2.) The indicator is at OFF position when the pump is running good. Once the pump has problem, it will shut off immediately and the red alarm indicator will flash in different conditions.

number	trouble	Flash frequency(times/second)	Interval time(second)
1	E-stop	On/no flash	No time interval between
2	Motor current overload	1	3
3	The water pump output pressure is low	3	3
4	Oil cylinder piston over stroke	once per second	No time interval between

Find the reason of trouble according to the different flash of the machine. When the fault happens, it will start high pressure generator again for only 3 seconds (if oil-way overpressure fault occurs, restart need run 15 seconds). If the machine shut down again, it will constantly cycle the flashing lights. The high pressure producer runs properly and the alarm light turns off until all the troubles are shooted.