The Manual for

Portable Basic Hydraulics Training Box

Brief introduction of portable hydraulic transmission structure

The portable hydraulic transmission training box device is based on the content requirements of general textbooks such as "Hydraulic and Pneumatic Transmission" and "Hydraulic Control Technology", and at the same time, it has absorbed the suggestions of teachers and students to reform the profession. The use of.

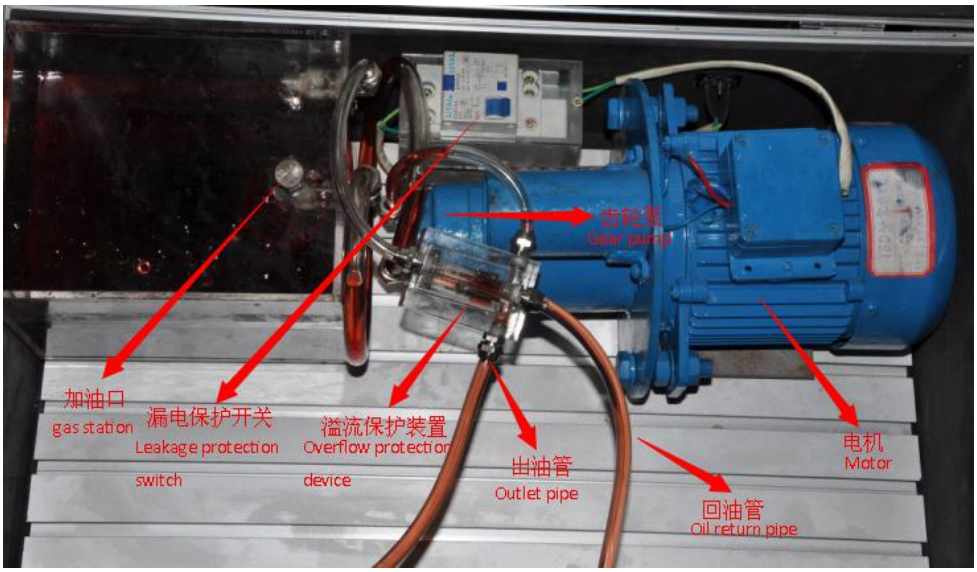
The training device is suitable for the teaching experiments of "Hydraulic and Pneumatic Transmission", "Hydraulic Control Technology" and other related courses in universities, technical colleges, vocational colleges, mechanical engineering, etc.; students can be more accurate through operation experiments and curriculum design , Vividly and deeply understand, master the structure of hydraulic components, circuit control principles and design methods.

The training box is mainly composed of: training box, fuel tank, motor and gear pump (integrated design), hydraulic components, oil pipes, etc.; the training box has the advantages of small size, light weight, and easy movement, which solves the test bench The shortcomings of live lectures that cannot be brought into the classroom.

Due to the update and improvement of the function and structure of the new product components, there are some inconsistencies with this manual, please understand, and hope that you can send us a letter or call for inquiries. Our company is responsible for explaining.

一.Operation guide:

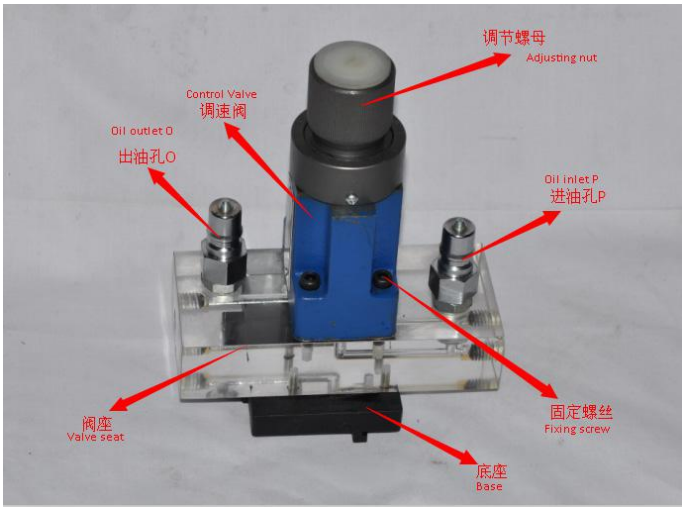
as the picture shows:



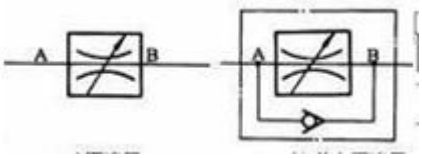
First open the box and add the hydraulic oil to about two-thirds of the oil tank. Connect the hydraulic circuit according to the instructions or general teaching materials. After confirming that the circuit is correct, plug in the power in the hydraulic box, and finally turn on the training box. Leakage protection switch, the motor oil pump starts to work, adjust the overflow protection device on the pumping station, adjust to a proper pressure (about 0.4 MPa), the hydraulic circuit starts to operate, after the experiment is completed, adjust the overflow device counterclockwise to its original position and close Turn off the leakage protection switch, unplug the power supply, and finally remove the connecting tubing, wipe the hydraulic components clean and put them back in place for next use.

（二） Basic introduction of symbols, structure and functions of hydraulic components:

1. 2FRM6A76 Control Valve



symbol：



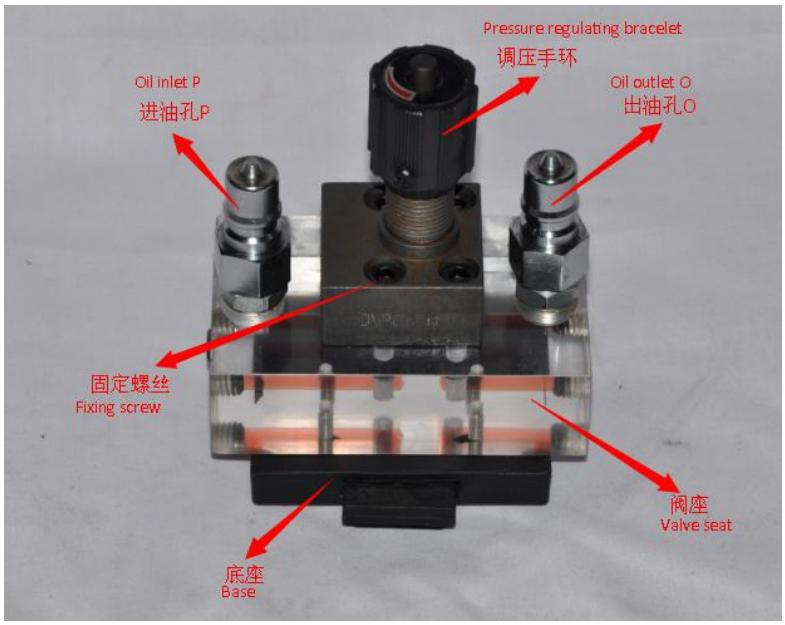
Control Valve One-way speed control valve

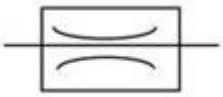
Working pressure range: 0-6.3Mpa

Rated flow: 10 L/min

P hole is the oil inlet, O hole is the oil outlet

2.DVP6 One-way throttle valve





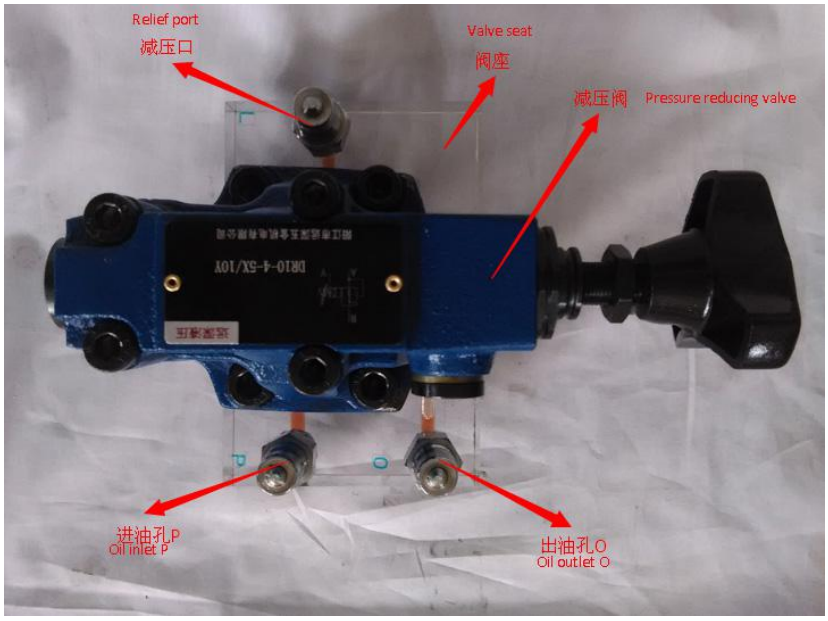
symbol:

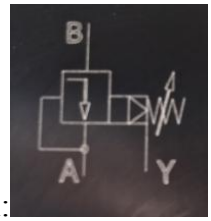
Working pressure range: 0-6.3Mpa

Rated flow: 10 L/min

P hole is the oil inlet, O hole is the oil outlet

3. DR1O Pressure reducing valve



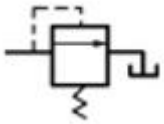
symbol: 

Working pressure range: 0-6.3Mpa

Rated flow: 10 L/min

P hole is the oil inlet, O hole is the oil outlet, L hole is the pressure relief hole

4. DG-01 Direct-acting relief valve



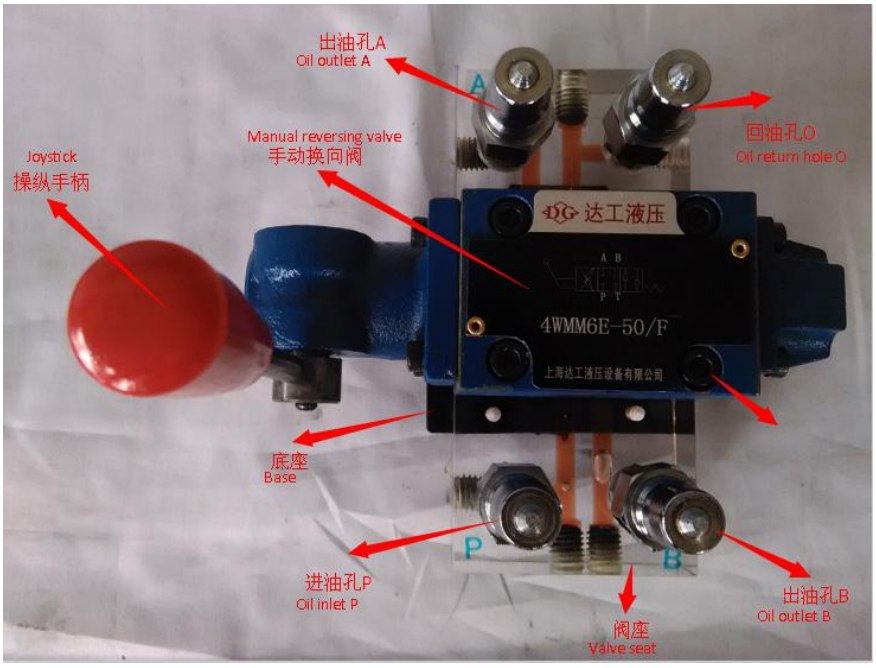
symbol:

Working pressure range: 0-6.3Mpa

Rated flow: 10 L/min

P hole is the oil inlet, O hole is the oil outlet

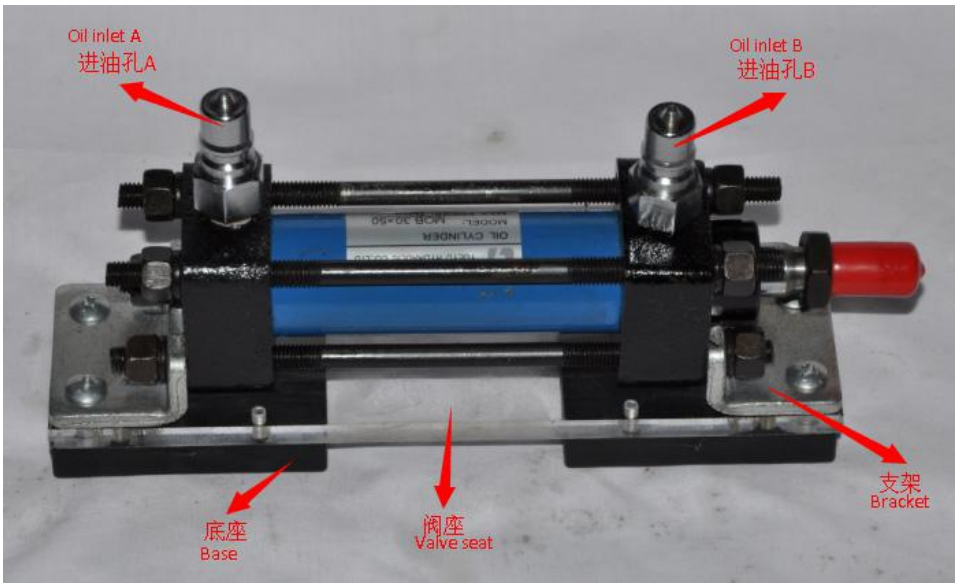
5.4WMM6E50 Manual reversing valve

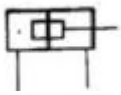


symbol: 

Working pressure range: 0-6.3Mpa
Rated flow: 10 L/min
P hole is the oil inlet, O hole is the oil return hole, A/B is the oil outlet

6.MOB　30*50 Double acting cylinder

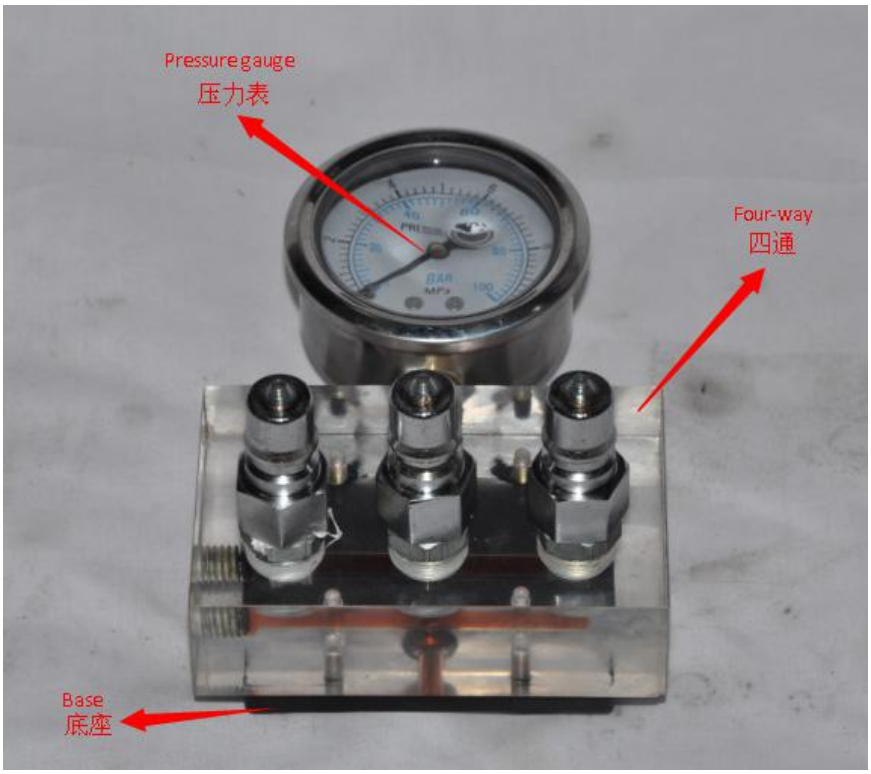


symbol： 

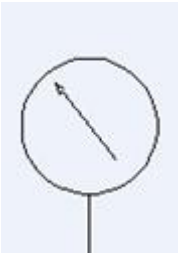
Effective maximum stroke of oil cylinder: 50 mm

Working pressure range: 0-6.3 Mpa

7.YN6 Glycerin pressure gauge



symbol:



Pressure gauge model: YN6 type

Pressure gauge stroke: 10MPa

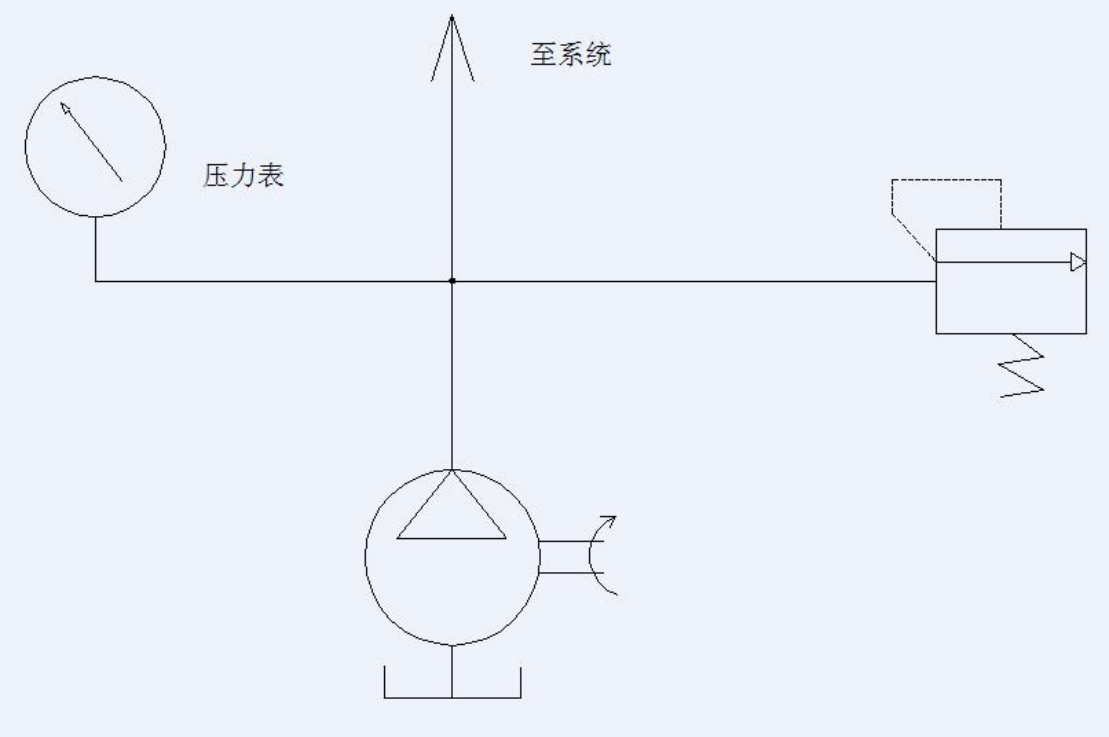
The installation base of the pressure gauge is made of imported transparent plexiglass material, and mainly adopts the YN6 pressure gauge.

二. Basic training content of hydraulic transmission:

1) Single-stage pressure regulating circuit of overflow valve:

In the circuit shown in the figure, adjusting the overflow valve can change the output pressure of the pump. When the set pressure of the overflow valve is determined, the hydraulic pump will work under the set pressure of the overflow valve, and the excess oil provided by the quantitative pump It flows back to the tank through the overflow valve, and the overflow valve plays the role of constant pressure overflow to keep the system pressure stable and not affected by load changes. So as to realize the pressure regulation and stabilization control of the hydraulic system.

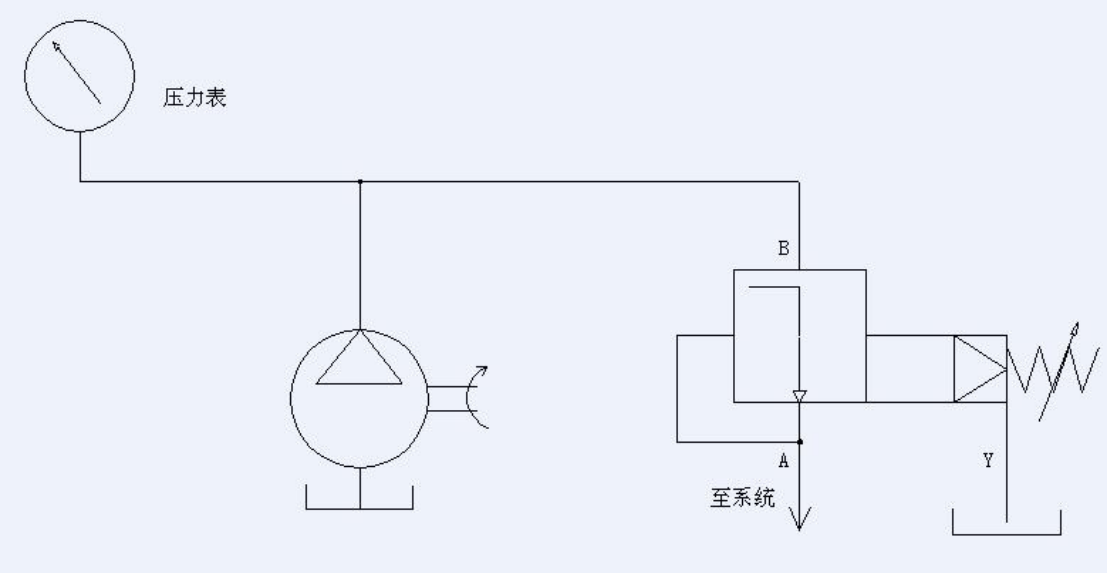
Components required for this circuit: pressure gauge, relief valve, oil pipe, manual reversing valve, double-acting cylinder



2) The primary pressure reducing circuit of the pressure reducing valve:

The circuit shown in the figure, when the system pressure is high, but the partial circuit or branch circuit requires lower pressure, the pressure reducing circuit can be used, such as the positioning and clamping circuit in the hydraulic system of the machine tool, and the control oil circuit of the hydraulic components, etc. , They often require lower pressure than the main oil circuit. The pressure reducing circuit is relatively simple, generally a pressure reducing valve is connected in series on the branch where low pressure is required. Although the use of a pressure reducing circuit can easily obtain a stable low pressure in a branch, pressure loss will occur when the pressure oil passes through the pressure reducing valve port.

Components required for this circuit: pressure gauge, pressure reducing valve, oil pipe, manual reversing valve, double acting cylinder

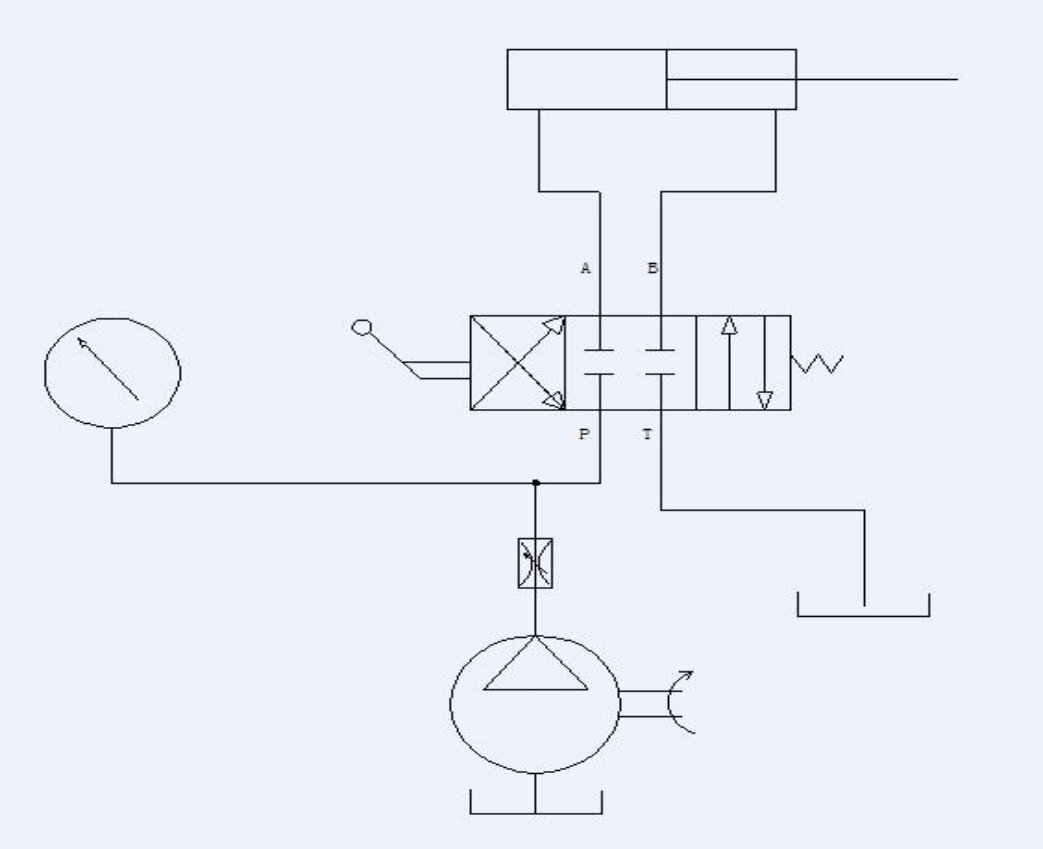


3) The oil inlet speed regulating circuit controlled by the speed regulating valve:

As shown in the circuit, when the hydraulic pump is working, the oil output by the hydraulic pump enters the hydraulic cylinder through the speed control valve, pushing the piston to move, and the excess oil flows back to the oil tank through the overflow valve. For the experiment and the following experiments, the overflow valve may not be installed, and the overflow valve can be replaced by an overflow device). The working speed of the hydraulic cylinder can be adjusted by adjusting the flow rate of the speed regulating valve, and the excess oil of the quantitative pump flows back to the oil tank through the overflow valve (overflow device).

The circuit has simple structure, low cost, and convenient use, but it has large energy loss, low efficiency and large heat generation. The fuel inlet throttle speed control circuit is used in light load, low speed, low load change and low power occasions that do not require high speed stability.

Components required for this circuit: pressure gauge, oil pipe, speed control valve, manual reversing valve, double-acting cylinder

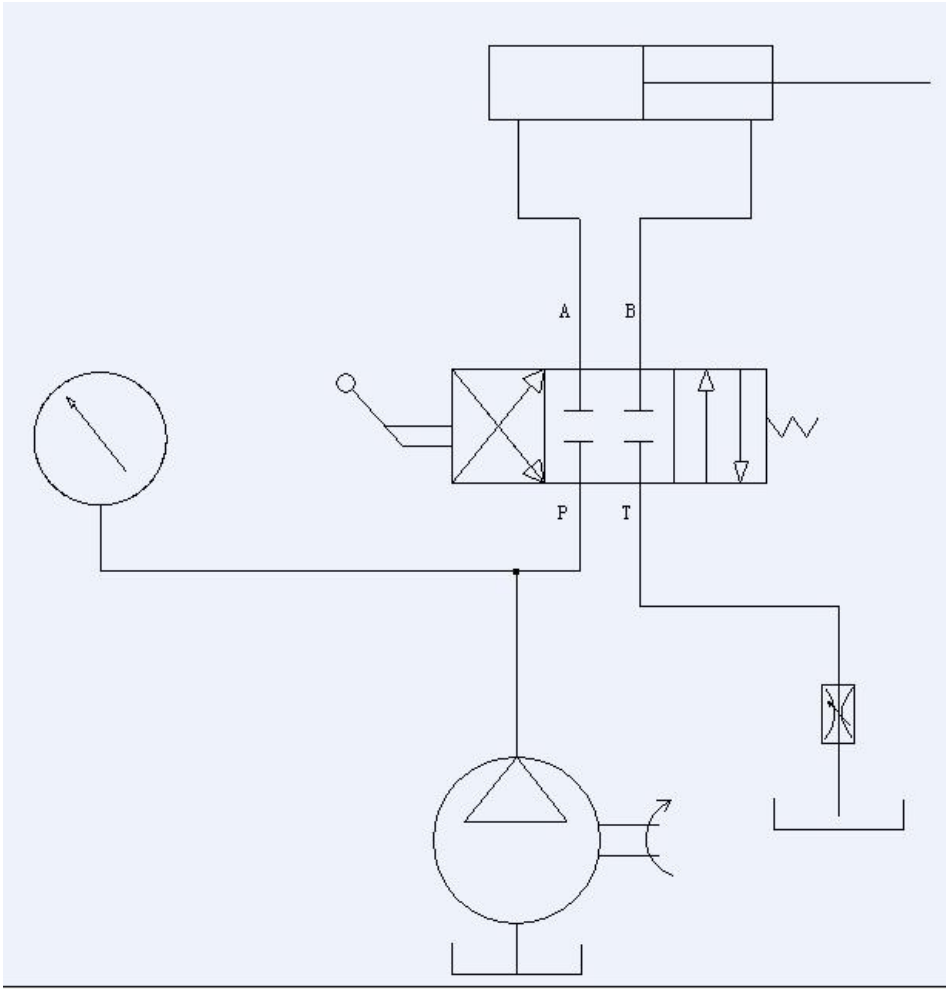


4) The oil return speed control circuit controlled by the speed control valve:

As shown in the circuit, the speed control valve controls the oil return of the hydraulic cylinder to achieve speed adjustment. The flow rate out of the hydraulic cylinder is adjusted by the speed regulating valve, that is, the flow rate into the hydraulic cylinder is adjusted. The excess oil of the quantitative pump flows back to the oil tank through the overflow valve (overflow device).

The characteristic of this circuit is that the speed control valve is installed on the oil return line, and there is a large back pressure on the oil return line, so it can act as a buffer when the external load changes, and the smoothness of movement is better than the oil inlet throttle speed control circuit. The oil return throttle speed control circuit is widely used in hydraulic systems with low power, large load changes, or high requirements for smooth motion.

Components required for this circuit: pressure gauge, oil pipe, speed control valve, manual reversing valve, double-acting cylinder

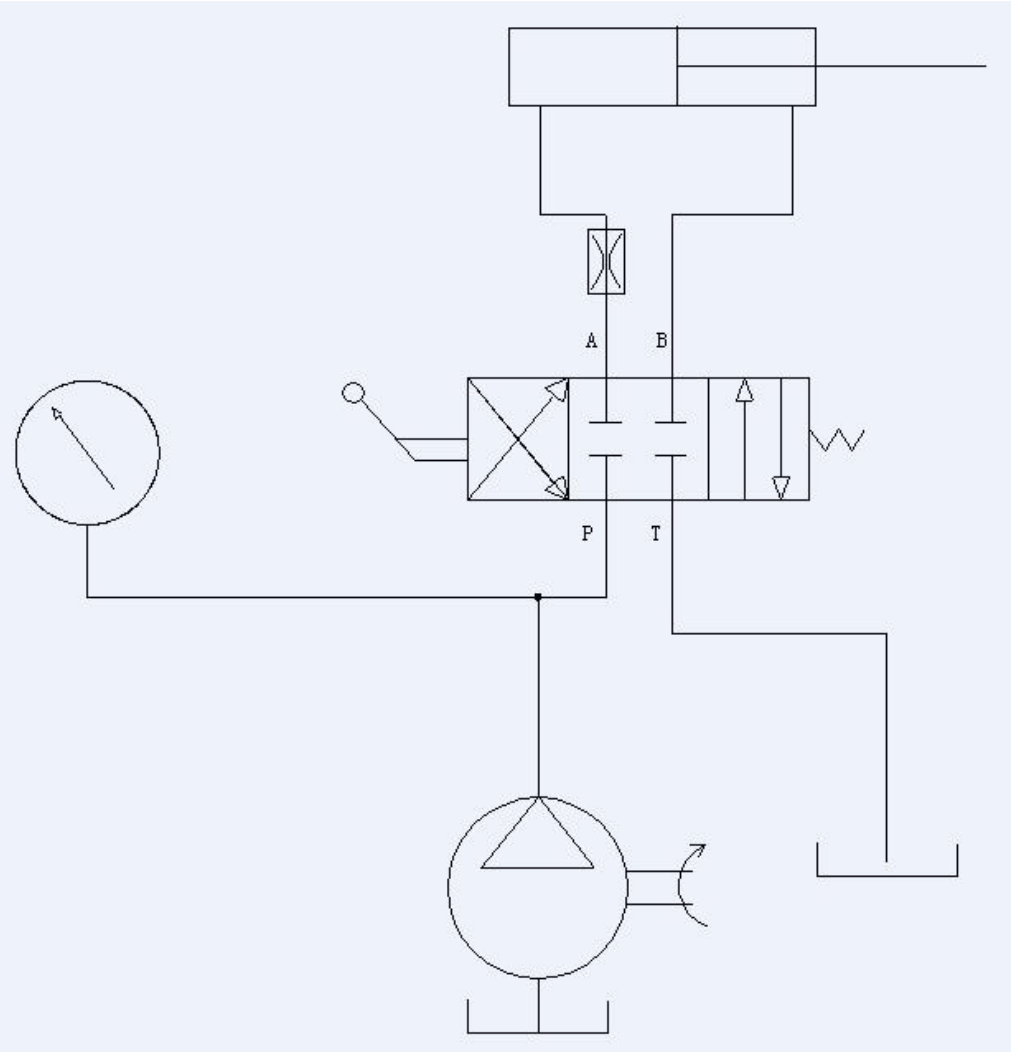


5) Throttle speed regulation circuit controlled by the throttle valve of the bypass oil circuit:

The circuit shown in the figure, this circuit connects the throttle valve to the side oil path in parallel with the actuator. By adjusting the flow area of the throttle valve, the flow rate of the quantitative pump back to the tank is controlled, and the flow rate into the hydraulic cylinder can be adjusted. Flow rate and speed regulation.

This kind of circuit has only throttling loss and no overflow loss. The pressure of the pump changes with the load, and the throttling loss and input power also change with the load. Therefore, this loop is more efficient than the previous two loops. Because the speed and load characteristics of this circuit are very soft, and the low-speed load capacity is poor, the application is less than the previous two circuits. It is only suitable for high-speed, heavy-duty, and high-power systems that do not require high speed stability, such as the main motion system of a planer , Conveying machinery hydraulic system, etc.

Components required for this circuit: pressure gauge, oil pipe, throttle valve, manual reversing valve, double acting cylinder

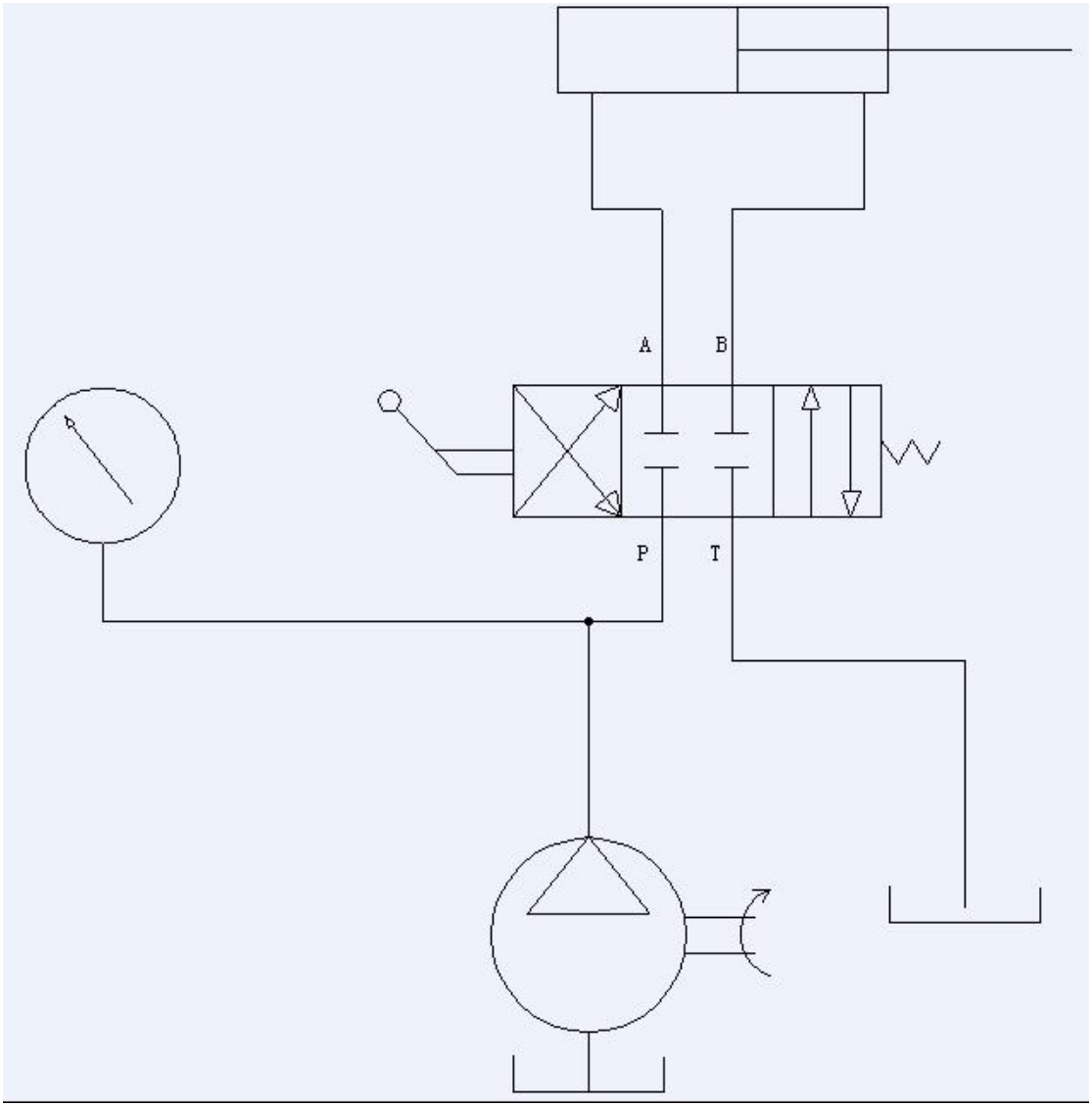


6) The reversing circuit of the reversing valve:

As shown in the figure, when the left position of the reversing valve is connected, the pressure oil output by the pressure pump enters the left cavity of the hydraulic cylinder, driving the piston of the double-acting cylinder to move to the right; when the right position of the reversing valve is connected, the pressure oil enters the right of the hydraulic cylinder Cavity, the piston moves left.

This circuit is often used in occasions where commutation is not frequent and automatic commutation is not required. Such as general machine tool fixtures, hydraulic presses, cranes, construction machinery, etc.

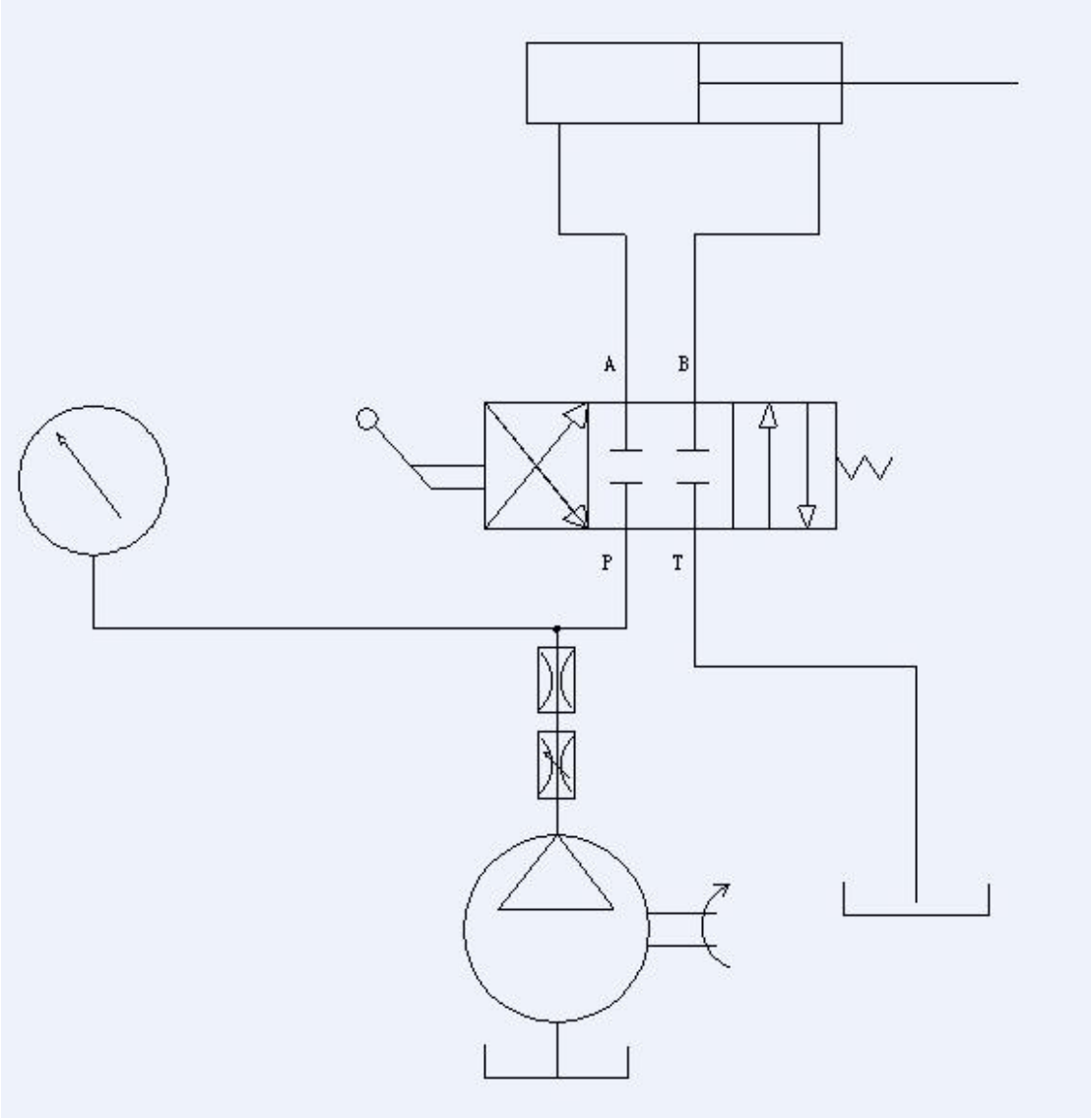
Components required for this circuit: pressure gauge, tubing, manual reversing valve, double-acting cylinder.



7) Series speed control circuit of speed control valve and throttle valve:

As shown in the figure, the secondary feed circuit of the speed control valve and the throttle valve. The speed control valve is used for the first feed throttling, and the throttle valve is used for the second feed throttling. In this kind of circuit, the opening of the throttle valve must be smaller than the opening of the speed control valve. In series connection, since the rear throttle valve can only control a lower speed, the adjustment is subject to certain restrictions.

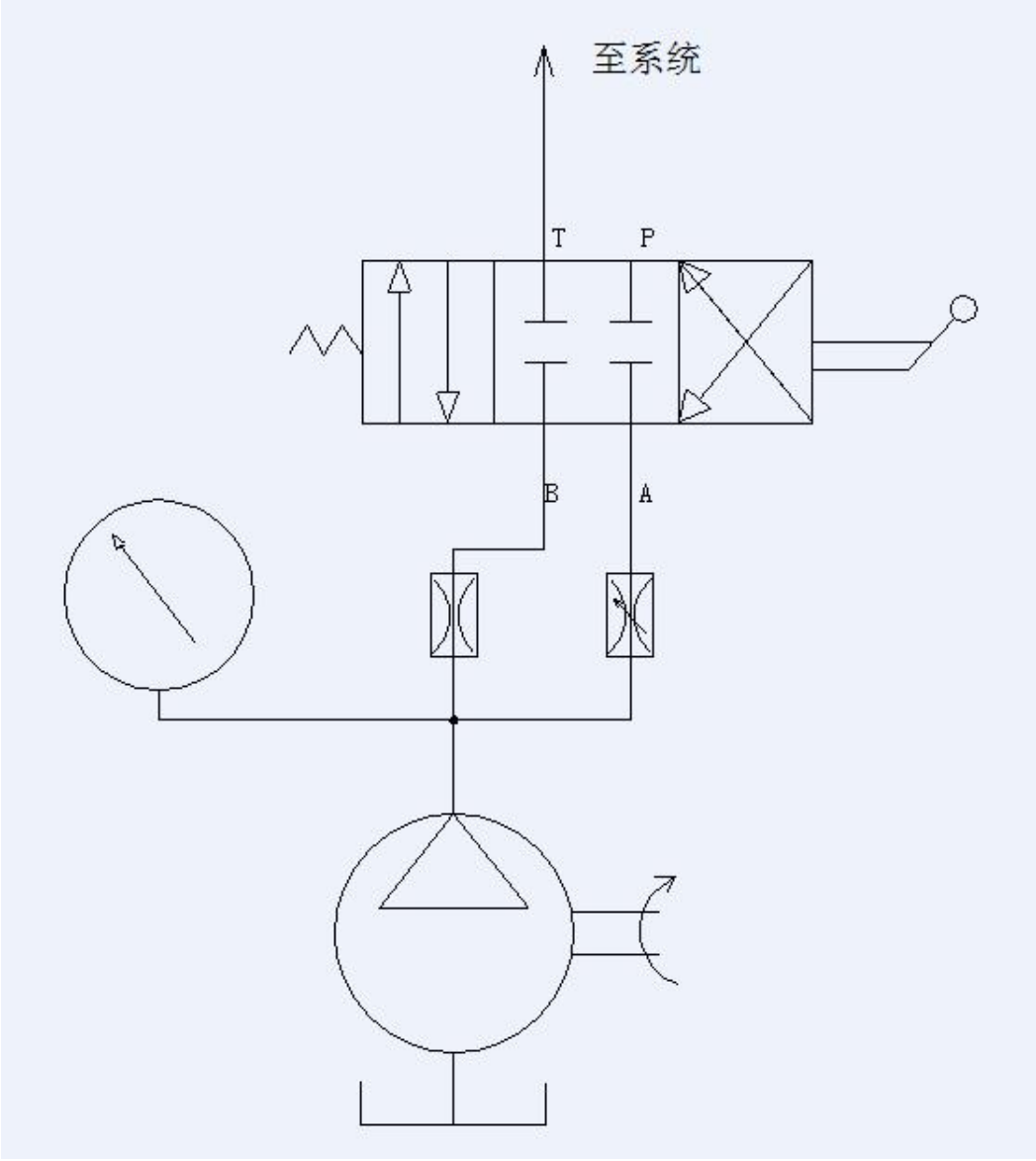
Components required for this circuit: pressure gauge, tubing, manual reversing valve, double-acting cylinder, speed control valve, throttle valve



8) Parallel speed control circuit of speed control valve and throttle valve:

As shown in the figure, the parallel connection of the speed control valve and the throttle valve in the secondary working speed switching circuit can overcome the shortcomings of the series regulation being limited. Three-position three-way valve (when the oil inlet port P or the oil return hole O of the three-position four-way valve is not connected to the oil pipe, it becomes a three-position three-way valve) It is the first time in the left position Feed working state, when it is in the right position, it is the second feed working state. (In order to show the effect, connect the oil pipe to the system directly to the oil return pipe, and you can observe the change of the pressure gauge when changing direction)

Components required for this circuit: pressure gauge, tubing, manual reversing valve, speed control valve, throttle valve

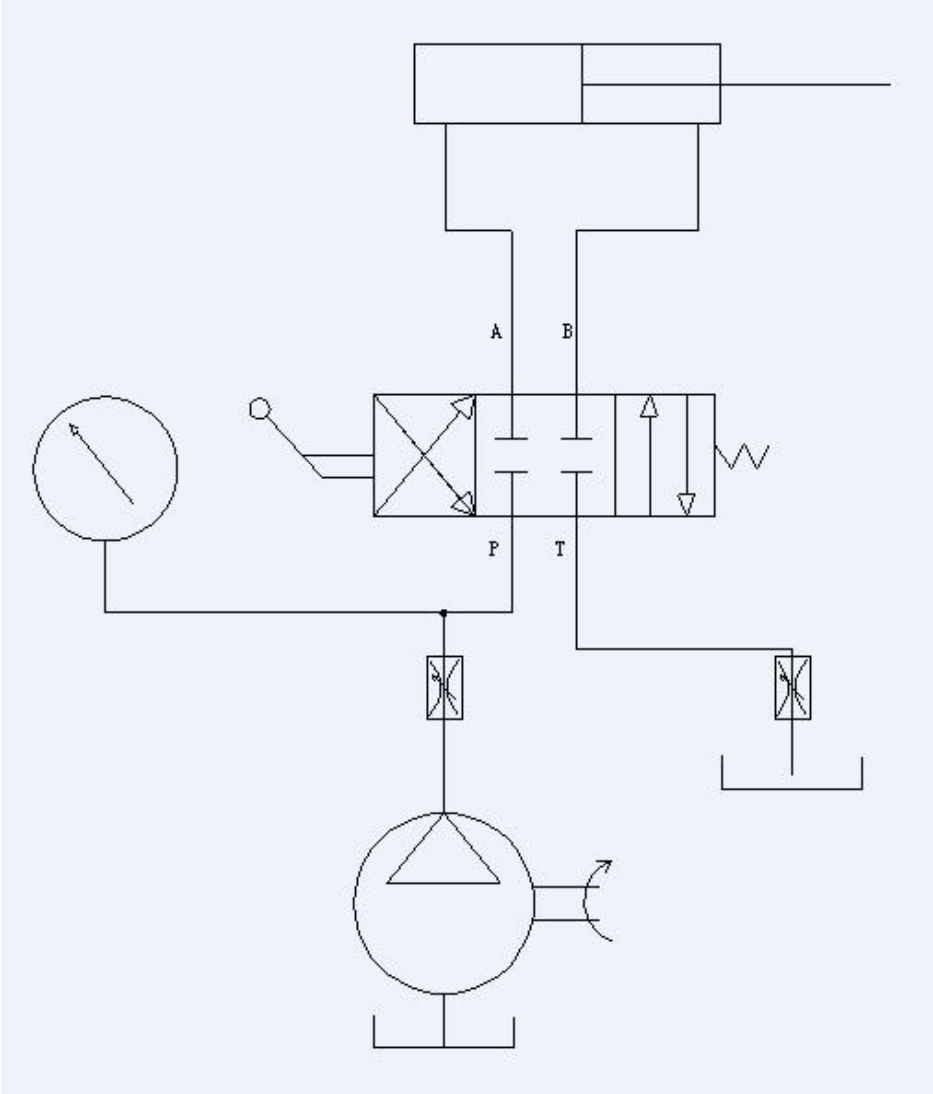


9) Throttle and speed regulation circuit at the same time when the oil is fed and returned:

The circuit as shown in the figure uses a throttle valve linked in the oil inlet and return paths for speed regulation. The reciprocating speed difference of the single-rod hydraulic cylinder is small, the speed rigidity is high, and the load is allowed to change the direction of action, the reciprocating stiffness difference is small, and the hydraulic cylinder can achieve approximate reciprocating stiffness transmission.

The bidirectional speed rigidity of this circuit is higher than that of the oil return throttle speed control system, and the low speed performance is also better. Because one more throttle valve is used, the efficiency is low. It is suitable for occasions where single-rod hydraulic cylinders work both back and forth, little change in load, and no absolute speed stability required. Such as the feed system of grinding machine, boring machine, etc.

Components required for this circuit: pressure gauge, tubing, manual reversing valve, double-acting cylinder, speed control valve, throttle valve



三.Disassembly and assembly training of hydraulic components:

Note that the parts should not be stained with impurities during the disassembly and assembly process. If impurities are accidentally stained, clean them with diesel or gasoline. Never wash with water to avoid rust and damage the components.

（一）Disassembly and assembly training of pressure reducing valve：

as the picture shows

The disassembly steps are as follows:

1) Remove 5 screws and 4 pilot valve body;

2) Remove 9, 8 adjusting screw and adjusting handle

3) Take out 2 main spool springs and 1 main spool

4) After disassembly and assembly, install the parts in order. After assembly, check if there are any parts left outside.

5) Take out 6 pilot valve core and 7 pilot valve spring

（二）Disassembly and assembly training of overflow valve

as the picture shows：

The disassembly steps are as follows:

1) Remove 1 screw and 2 adjustment handle;

2) Remove 3 adjusting seat and 4 push rod;

3) Take out 5 pressure spring and 6 valve core

4) Remove the 7 end cover screws;

5) After disassembly and assembly, install the parts in order. After assembly, check if there are any parts left outside.

（三）Disassembly and assembly training of manual reversing valve

as the picture shows：

1. Fixing screws	7. Position the steel ball and spring seat	13. Push rod spring
2. Spring seat	8. Rear cover	14.Putter
3. Spool	9. Front end cover	
4. Valve body	10. Rear cover spring	
5. Front and rear sealing rings	11. Positioning spring screw	
6. Front and rear cover screws	12. Positioning spring	

The disassembly steps are as follows:

1) Remove 1, 6, 15 screws and 8 rear cover;

2) Take out 10 rear cover springs and 2 spring seats;

3) Remove 9 front cover and 5 front and rear sealing rings;

4) Remove 11 positioning spring screw and 12 positioning spring;

5) Take out 7 positioning steel ball and spring seat;

6) Take out 14 push rod and 13 push rod spring;

7) After disassembly and assembly, install the parts in order. After assembly, check if there are any parts left outside.

（四）Disassembly and assembly training of hydraulic cylinder

as the picture shows：

1. Fasten the screws	4. Y type sealing ring	7. Rear cover
2. Stem	5. Cylinder	8. Front end cover
3. Piston	6. Bracket fixing screws	9. Bracket

The disassembly steps are as follows:

1) Remove 1, 6 screws and 9 bracket;

2) Remove 7 rear cover and 8 front cover;

3) Take out 2 valve stems, 3 pistons and 4 sealing Y-rings;

4) After disassembly and assembly, install the parts in order. After assembly, check if there are any parts left outside.

（五）Disassembly and assembly training of throttle valve

as the picture shows

The disassembly steps are as follows:

1) Remove 1, 6 screws and 9 bracket;

2) Remove 7 rear cover and 8 front cover;

3) Take out 2 valve stems, 3 pistons and 4 sealing Y-rings;

4) After disassembly and assembly, install the parts in order. After assembly, check if there are any parts left outside.

（六）Disassembly and assembly training of speed control valve

as the picture shows:

1. Fixed sleeve	5. Fixing set screws	9. Seal seat
2. Pressure regulating bracelet	6. Fixing screws	10. Compression spring
3. Pressure regulator seat	7. Putting	11.Spool
4. Valve body	8. Pressure regulating screw	

The disassembly steps are as follows:

1) Remove 5, 6 screws and 2 pressure regulating bracelet;

2) Remove 3 pressure regulating seat and 8 pressure regulating screw;

3) Take out 7 push rod and 9 seal seat;

4) Take out 10 pressure spring and 11 valve core;

5) After disassembly and assembly, reinstall the parts in order, and check if there are any parts missing outside.

（七）Disassembly and assembly training of hydraulic self-locking joints

as the picture shows

The disassembly steps are as follows:

1) Remove 3 nuts and 2 connecting screws;

2) Remove 5 male connectors and 4 connecting screws;

3) After disassembly and assembly, install them back in order, and check if any parts are missing.