

**The Manual for**  
**Portable Basic Pneumatic Training Box**

## **Introduction to Portable Basic Pneumatic Training Box**

The training box is mainly composed of: a training box, a micro air pump, a gas pump power source, a pneumatic component, etc.; the training box has the advantages of small size, light weight, and easy movement, and solves the shortcomings that the test bench cannot be brought into the classroom to lecture. .

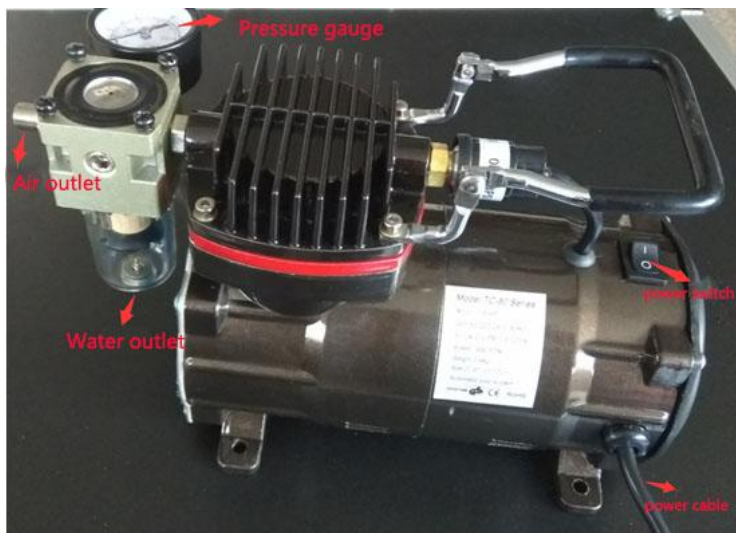
Due to the update and improvement of the function and structure of the new product components, please be aware of the inconsistency with this manual. At the same time, I hope that I can call us for enquiry. The company is responsible for the explanation.

## 1.Operation guide:

First open the training box, follow the instructions or the air pressure common teaching materials to connect the pneumatic circuit, after confirming that the circuit connection is correct:



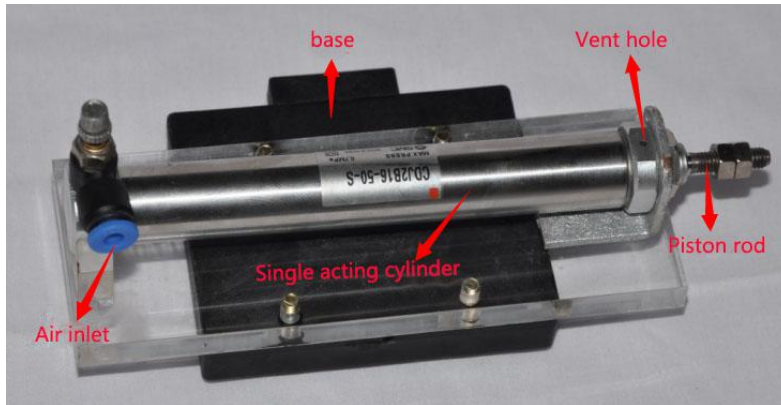
Then turn on the power switch of the micro air pump, as shown in the figure: the air pump starts to supply air, and the pneumatic circuit starts to demonstrate.

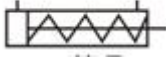


The air pump starts to supply air, and the pneumatic circuit starts to demonstrate. (If the working time of the air pump is too long, it will stop automatically. After cooling, the air supply can be restarted. In the cooling process, the air pump power switch should be turned off).

## 2. Basic introduction to the structure, function and symbol of pneumatic components

### 1) Single acting cylinder



symbol: 

Working medium: clean compressed air

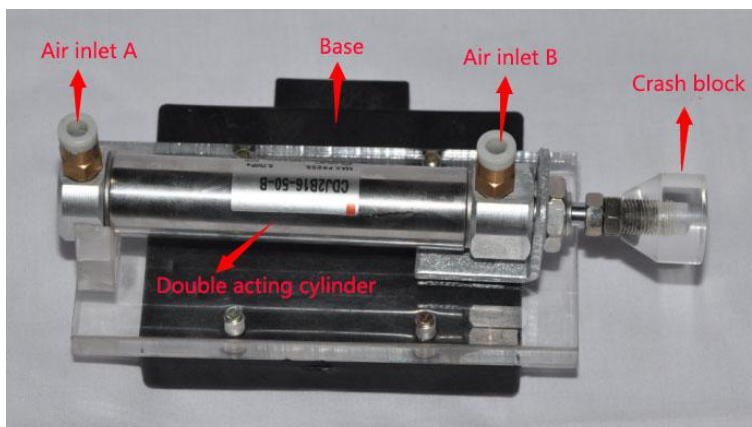
Working pressure: 0.06-0.8MPa

Pressure resistance: 1.0 MPa

Medium temperature: -10-60 ° C

Ambient temperature: -5-60 ° C

### 2) Double acting cylinder

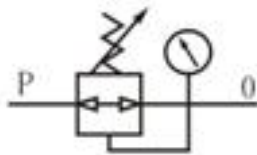
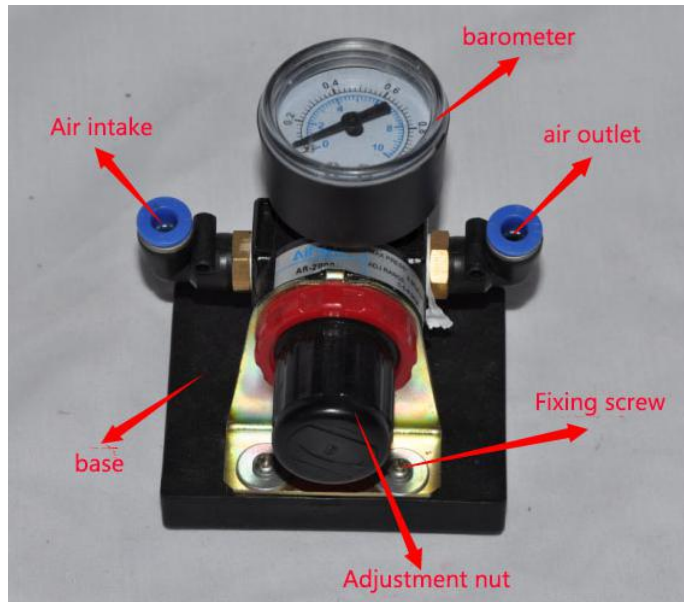


Symbol: 

Working medium: clean compressed air

Working pressure: 0.06-0.8MPa  
Pressure resistance: 1.0 MPa  
Medium temperature: -10-60 ° C  
Ambient temperature: -5-60 ° C

## 2) Pressure reducing valve



Symbol:

Model: AR2000

Take-up thread: G1/4

Filtration: 40 μ m

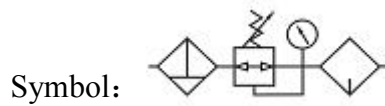
Pressure adjustment range: 0.05-0.8MPa

Maximum adjustable pressure: 0.95MPa

Maintain pressure resistance: 1.5 MPa

Medium and ambient temperature: 5-60 ° C

## Oil mist triple piece



Model: AC2000                      take-up thread: G1/4

Filtration: 40  $\mu$  m                      Cup capacity: 15cm<sup>3</sup>

Pressure adjustment range: 0.05-0.85MPa

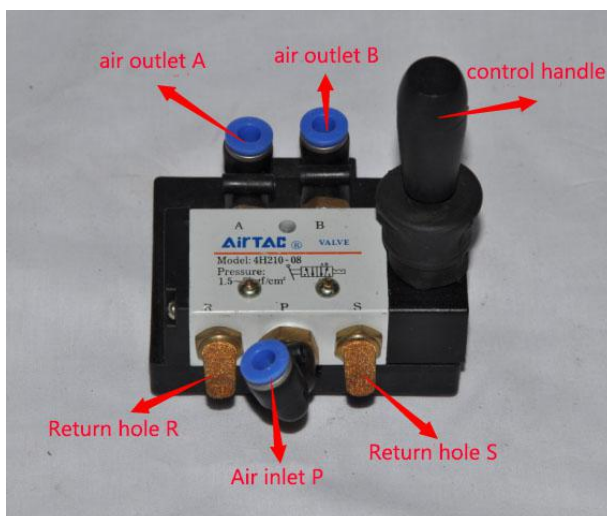
Oil cup capacity: 25cm<sup>3</sup>

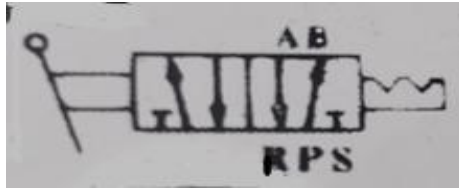
Maximum adjustable pressure: 0.95MPa Medium and ambient temperature: 5-60 °C

Maintain pressure resistance: 1.5MPa

Lubricating oil: VG32 or similar oi

## 2/2-way manual reversing valve





Symbol:

Model: 4H210-08 (two-position five-way valve)

Nominal diameter: 8mm

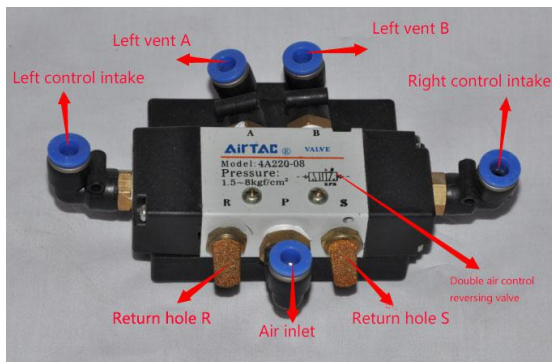
Working pressure: 0-10MPa

Take over thread; G1/4

Operating force: 7N

Medium and ambient temperature: 5-60 °C

### Double air control two-position five-way reversing valve



Symbol:

Working medium: clean compressed air

Effective sectional area: 16mm<sup>2</sup>

Take-up thread: Inlet and outlet gas G1/4 Exhaust gas G1/8

Working pressure range: 0.15 -0.8MPa

Maximum pressure resistance: 1.05MPa

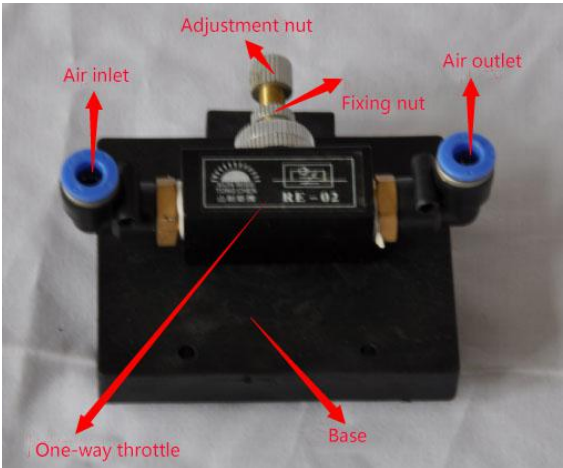
commutation frequency:  $\geq 5$ Hz

Reversing time:  $\leq 0.05$ S

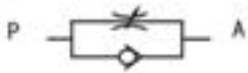
Minimum control pressure: 0.2MPa

Medium and ambient temperature: 5 - 60 ° C

### Throttle valve



Symbol:



Nominal diameter: 6mm 8mm

Flow rate: 230L/min: 460L/min

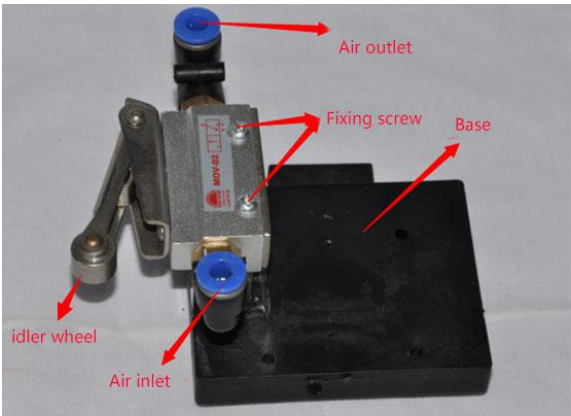
(Maximum flow rate at a pressure of 0.5 MPa and a temperature of 20 ° C)

Working pressure: 0.05-0.80 MPa

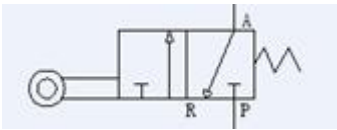
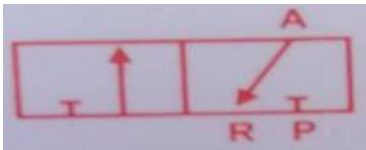
Take-up thread: G1/8: G1/4

Working temperature: 5-60 ° C

### Roller lever valve



Symbol:





Take-up diameter: G1/4

Effective sectional area: 2.5mm<sup>2</sup>

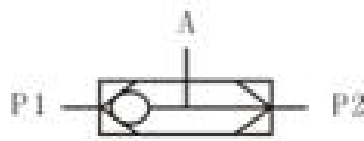
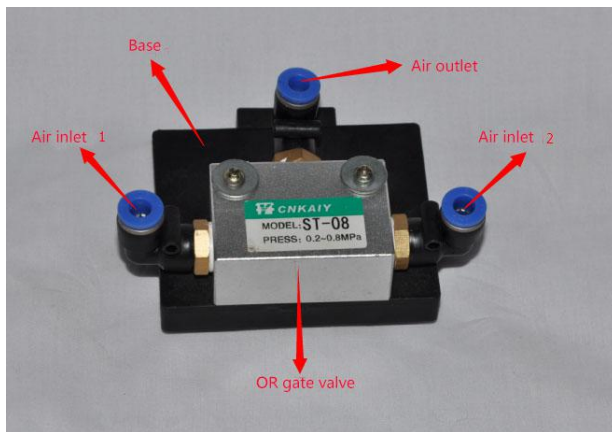
Working medium: clean compressed air

Operating force: 10N (open the valve completely when the inlet pressure is 0.5MPa)

Valve stroke: 5.5mm (total stroke from free position to full valve opening)

Environment and medium temperature: 5-60 ° C

### OR gate valve



### Symbol:

Nominal diameter; 8mm

Effective sectional area: 20mm<sup>2</sup>

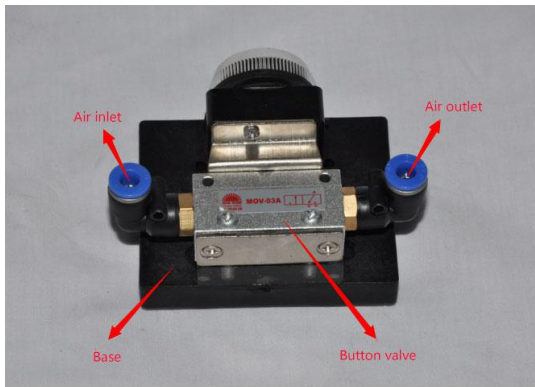
Working pressure: 0.05-0.80 MPa

Commutation time: 0.03S

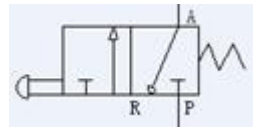
Service life: ≥ 2 million times

Working temperature: 5-50 ° C

## Button valve



Symbol:



Take-up diameter: G1/4

Effective sectional area: 2.5mm<sup>2</sup>

Working medium: clean compressed air

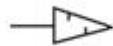
Operating force: 10N (open the valve completely when the inlet pressure is 0.5MPa)

Valve stroke: 5.5mm (total stroke from free position to full valve opening)

## Silencer



Symbol:



Nominal diameter: 8mm (G1/4), 10mm (G3/8)

Silencing effect:  $\geq 20$ dB

Working pressure; 0-0.8MPa

Working temperature: 25-80 ° C

Three-way, four-way, L-type joint, air plug



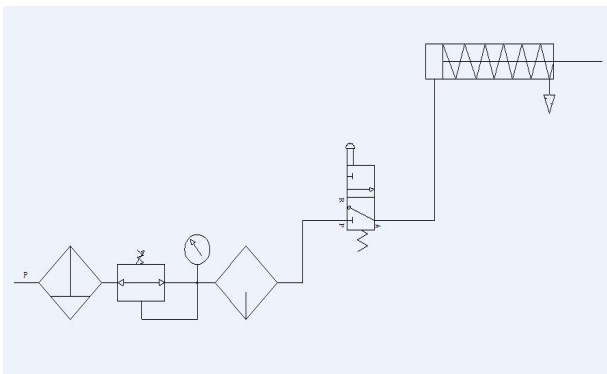
The plug-in fitting is suitable for the connection of nylon tube and plastic tube. The maximum working pressure is 1.0MPa. When using, first fix the joint body, cut the tube of the required length vertically, repair the incision burr, insert the tube into the joint, and make the tube reach the bottom through the spring piece and the sealing ring, so that when the tube is firmly connected, sealed, and disassembled, the tube is pushed into the joint by hand, and then the top sleeve is pushed inward to pull out the tube. The specifications used are: L-type pipe joints, T-type three-way pipe joints, and four-way pipe joints.

### 3. Basic circuit of pneumatic transmission

#### 1) The push button valve controls the commutation loop of a single-acting cylinder:

As shown in the circuit, the circuit uses a manual button valve to control the single-acting cylinder for commutation. Press the button and the piston extends; release the button and the piston retracts.

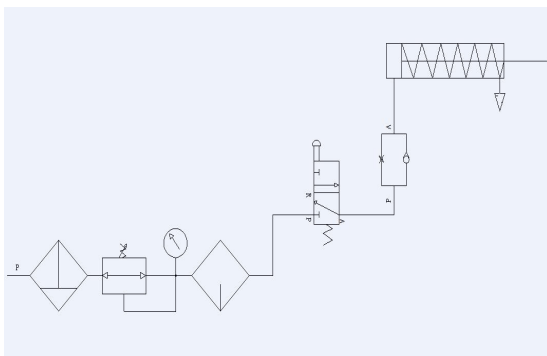
Required components: oil mist triple, single acting cylinder, push button valve



#### 2) Single-acting cylinder speed control loop:

As shown in the circuit, the circuit uses a manual button valve to control the single-acting cylinder for commutation. When the button is pressed, the piston is extended, and the throttle valve is adjusted to extend the speed of the single-acting cylinder; when the button is released, the piston is retracted.

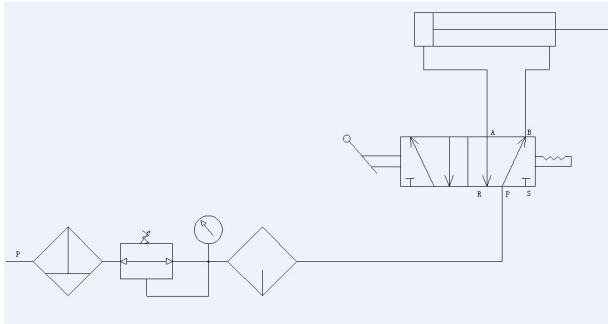
Required components: oil mist triplex, single acting cylinder, push button valve, throttle valve.



### 3) Commutation circuit of manual reversing valve (hand control)

As shown in the figure, the forward and reverse of the double-acting cylinder can be controlled by the two-position five-way manual reversing valve. The manual reversing valve can be used to advance or retreat the cylinder. If the speed is too fast, the oil mist triplex can be adjusted. Lowering the air pressure slows the cylinder speed.

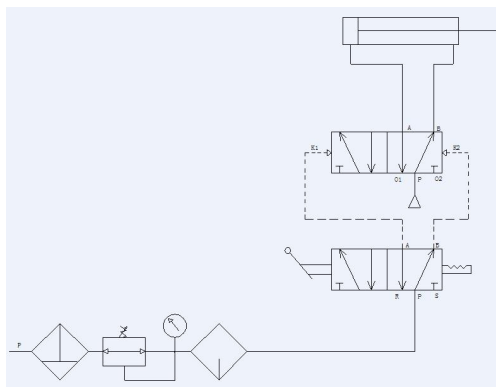
Required components: oil mist triple, double acting cylinder, manual reversing valve



### 4) Commutation circuit of manual reversing valve (air control)

As shown in the figure, the forward and reverse of the double-acting cylinder can be controlled by the two-position five-way dual air-controlled reversing valve. The two-way five-way dual air-controlled reversing valve can be reversed by switching the manual reversing valve left and right. The air-controlled reversing valve controls the cylinder to advance or retreat. If the speed is too fast, the oil mist triplet can be adjusted to lower the air pressure to slow the cylinder speed.

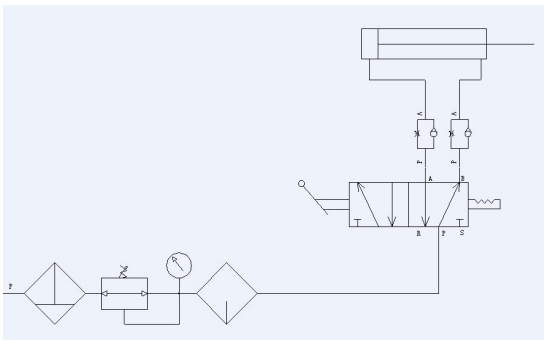
Required components: oil mist triple, double acting cylinder, manual reversing valve, dual air control reversing valve.



### 5) Speed control loop of double-acting cylinder

The two-position five-way manual reversing valve controls the speed control loop of the double-acting cylinder as shown. In the experiment, the manual reversing valve is switched left and right, and the double-acting cylinder is extended or retracted, and the throttle valve of the double-acting cylinder intake port is adjusted to make the cylinder speed become faster or slower.

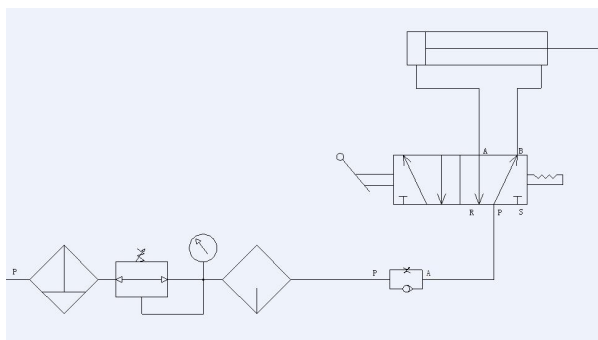
Required components: oil mist triple, double acting cylinder, manual reversing valve, throttle



### 6) Throttle valve speed control loop

As long as the throttle valve is adjusted as shown in the figure, the speed of the entire circuit can be controlled.

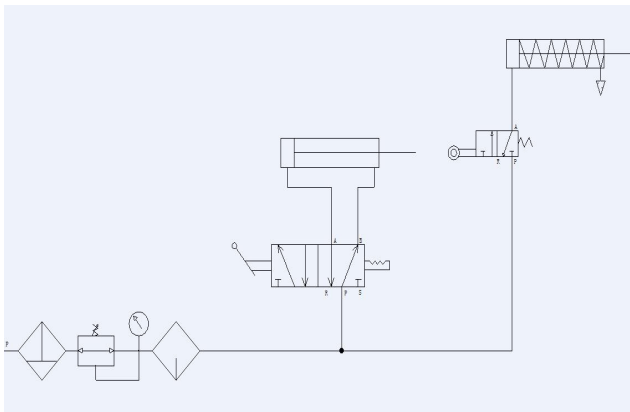
Required components: oil mist triple, double acting cylinder, manual reversing valve, throttle



### 7) Two-cylinder sequential circuit

As shown in the figure, the two-position five-way manual reversing valve is switched, the double-acting cylinder is extended, the roller lever valve is touched, and the air source single-acting cylinder is extended; otherwise, the double-acting cylinder is retracted, and the roller lever valve is disconnected. The air source, the single-acting cylinder is retracted, thus forming a two-cylinder sequential circuit.

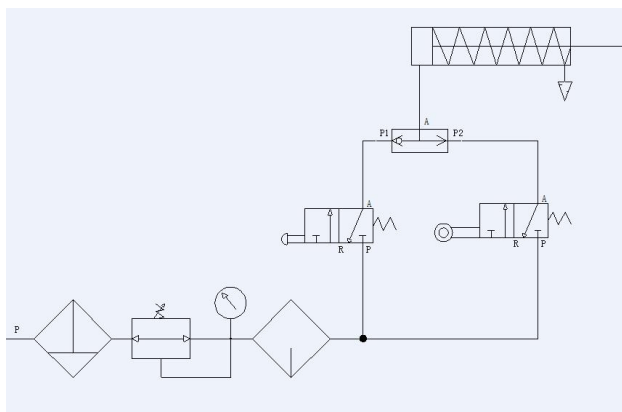
Required components: oil mist triple, double acting cylinder, manual reversing valve, single acting cylinder, roller lever valve



### 8) Single-acting cylinder reversing circuit controlled by OR gate valve

Press the button valve or the roller lever valve as shown, and the single-acting cylinder piston can be extended to release the single-acting cylinder to retract. In pneumatic control systems, it is sometimes necessary to operate a single-acting cylinder at a different location.

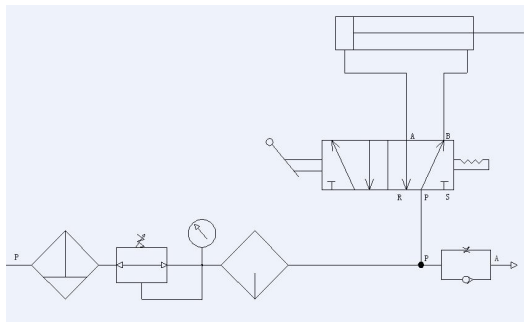
Required components: oil mist triple, single acting cylinder, roller lever valve, push button valve, or gate valve



### 9) Remote control unloading circuit

As shown, adjust the oil mist triple to bring the cylinder to the desired speed. The two-position five-way manual reversing valve is used to control the forward and reverse of the double-acting cylinder, and the manual reversing valve can be switched forward or backward to make the cylinder advance or retreat. If the speed is too fast, the oil mist triplet can be adjusted to reduce the air pressure to change the cylinder speed. Slow; at the same time, the throttle valve can be adjusted to reach the unloading pressure to make the cylinder speed slow, and the unloading pressure is quickly discharged through the throttle valve A.

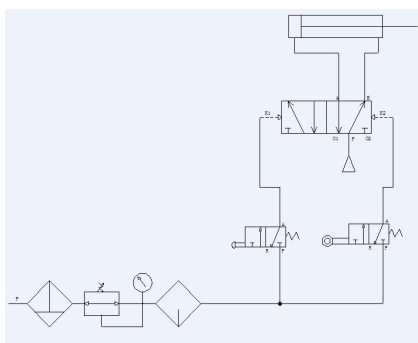
Required components: oil mist triple, double acting cylinder, throttle valve, manual reversing valve.



### 10) Double-acting cylinder circuit controlled by push button valve

As shown, only the push button valve or the roller lever valve is pressed to control the dual pneumatically controlled directional control valve to reverse the double acting cylinder. The characteristic of this circuit is that the first control is effective. Only when it is released, the other valve will work.

Required components: oil mist triple, double acting cylinder, push button valve, roller lever valve, dual air control reversing valve.

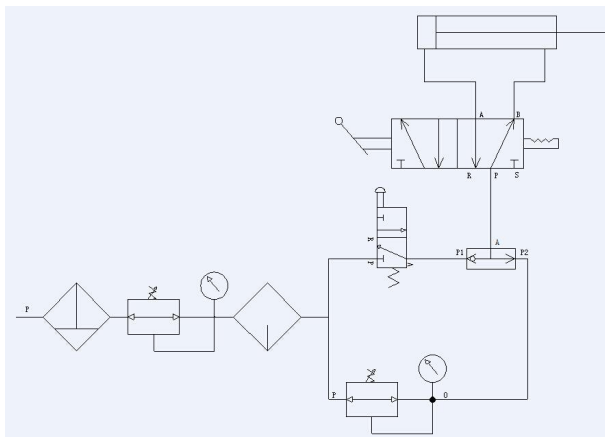




### 11) Pressure reducing circuit controlled by pressure reducing valve

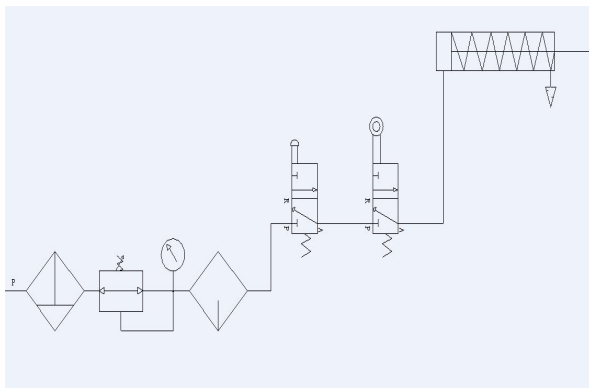
As shown in the figure, in some practical applications, some pneumatic control systems require high and low pressure selection. The circuit has two different pressures from one or more pressure reducing valves. The pneumatic system can obtain the required high pressure and low pressure. Output. When the button valve is pressed, it is a high pressure output, and when it is released, it is a low pressure output through the pressure reducing valve.

Required components: oil mist triple, button valve, pressure reducing valve, or gate valve, manual valve, double acting cylinder.



### 12) Two-acting cylinder reversing circuit controlled by two hands

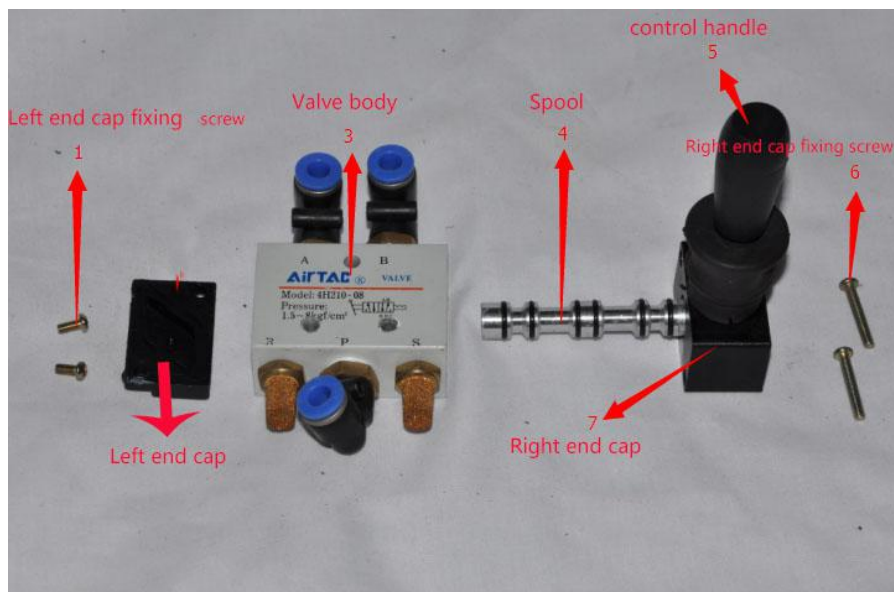
As shown in the figure, the button valve and the roller lever valve are connected in series to form a two-hand control circuit, and only the two hands are pressed to extend the single-acting cylinder. In operation, when any one hand leaves, the control signal disappears and the single-acting cylinder is reset.



#### 4. Disassembly and assembly of pneumatic components

In the process of disassembly, if there is any debris falling inside the valve body or on the valve core, you need to gently wipe it with a cotton cloth. Be sure to clean it up and then put it back. Never wash it with water to avoid damage to the components.

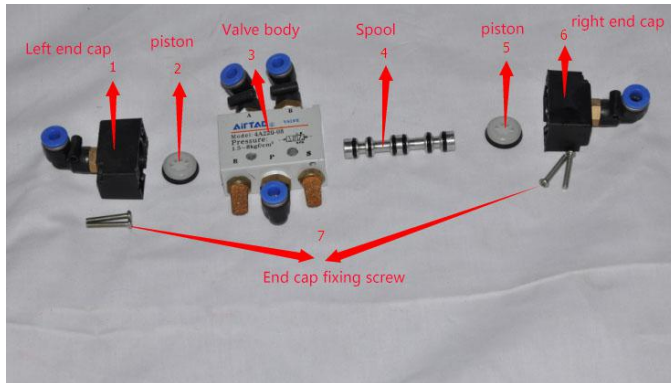
##### 1) Disassembly and assembly training of two-position five-way manual reversing valve



The disassembly steps are as follows:

- 1) Remove 1 left end cap fixing screw and 2 left end cap
- 2) Remove 6 right end cap fixing screws and 4, 7, and 5 spools, right end cap, and operating handle
- 3) After the disassembly is completed, install it back in order and check if there are any parts left outside.

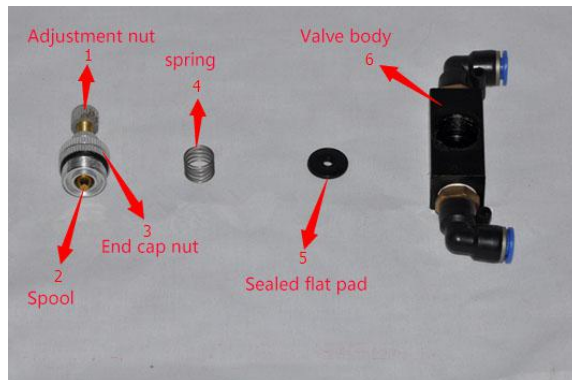
## 2) Disassembly and assembly training of dual air control



The disassembly steps are as follows:

- 1) Remove the 1 and 7 end cap fixing screws and the 2 and 6 end caps (the same one is removed first);
- 2) Remove 2, 5 pistons and 4 springs;
- 3) After the disassembly is completed, install it back in order and check if there are any parts left outside.

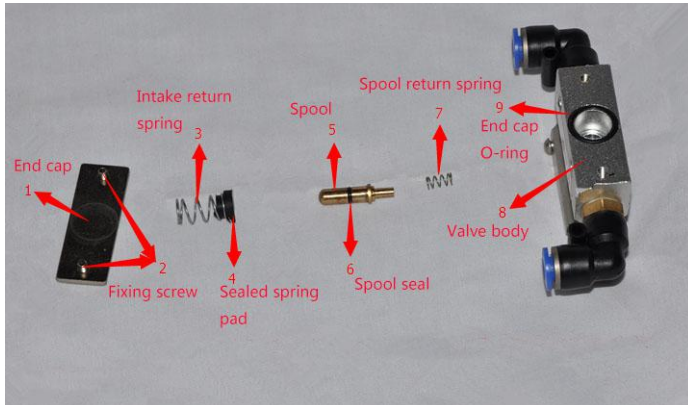
## 3) Disassembly and assembly of the throttle valve



The disassembly steps are as follows:

- 1) Remove the 3-end cap nut;
- 2) Take out 4 springs and 5 sealed flat pads;
- 3) After the disassembly is completed, install it back in order and check if there are any parts left outside.

#### 4) Disassembly and assembly training of the roller lever valve



The disassembly steps are as follows:

- 1) Remove the 2 fixing screws and the 1 end cover;
- 2) Take out 3 intake return springs and 4 seal spring pads;
- 3) Remove 7 spool return spring and 5 spool
- 4) After the disassembly is completed, install it back in order and check if there are any parts left outside.

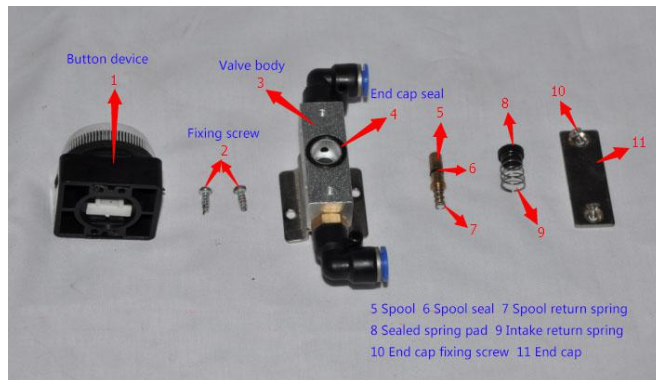
#### 5) Disassembly and assembly training of pressure reducing valve



The disassembly steps are as follows:

- 1) Remove the 1 bracket nut and bracket;
- 2) Remove the 3 pressure regulating nut and the 4 pressure regulating spring;
- 3) Remove the 7-piston and 5-end caps;
- 4) Remove the 6 pressure sensitive needle
- 5) After the disassembly is completed, install it back in order and check if there are any parts left outside. .

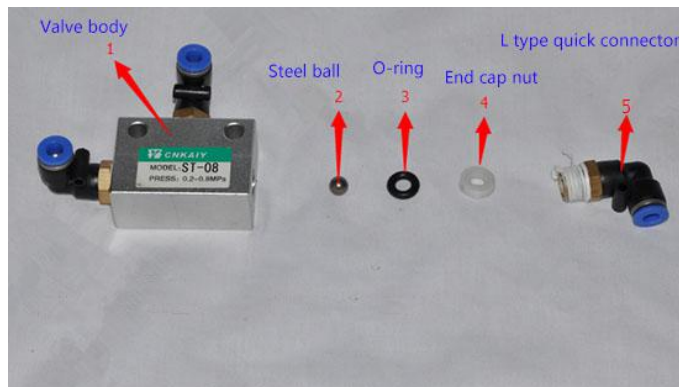
## 6) Disassembly and assembly training of button valve



The disassembly steps are as follows:

- 1) Remove the 2 fixed self-tapping screws and button device;
- 2) Remove the 10 end cap fixing screws and the 11 end caps;
- 3) Take out the 8 seal spring seat and 9 intake return spring;
- 4) Take out the 7-valve return spring and the 5-valve;
- 5) After the disassembly is completed, install it back in order and check if there are any parts left outside.

## 7) Or the disassembly and assembly training of the valve



The disassembly steps are as follows:

- 1) Remove the 5L type quick connector and the 4 end cap nut (the left and right can be removed);
- 2) Take out 3 seals and 2 steel balls;
- 3) After the disassembly is completed, install it back in order and check if there are any parts left outside.

