

# **TOOLCEN**

intelligen

**TOOLCEN three axis servo  
open robot instruction**

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## Shenzhen Tongcheng Automation Equipment Co., Ltd

Shenzhen Tongcheng Automation Equipment Co., Ltd. is located in the country's largest economic zone ---- Shenzhen City. Is a collection research and development, design, manufacture, sales and service in the integration of integrated enterprise.

The company is committed to packaging, electrical appliances, daily necessities, medical and other fields, R & D and production of single-axis, two-axis, three-axis, five-axis servo injection molding, the company has a number of industries, Machine tool, further development and production of IML in-mold labeling system, IMD mold inlay system, PET preforms to take special robots, and CNC lathe loading and unloading manipulator, CNC machining center loading and unloading manipulator, punch - forging manipulator, more Joint robot applications, for the automation industry to provide professional intelligent equipment.

We uphold the "innovation as the driving force, market-oriented, customer-centric to serve as a fundamental" concept, is a new technology services company, to provide customers with the best overall automation program.



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## I. Notes

### 1. Operation notes

All the designs and operation specifications are based on injection molding manipulator, please do not use the arms for other purposes. Our company is not responsible for any accident or injury resulting from any misuse of the products. The following is a safety operation specification of using this series of manipulators. Before operating, please read carefully and strictly comply with the specifications to ensure safety:

1. This life span of machine is 5~10 years
2. Keep away from the movable range while running the manipulator.
3. Do not open or remove the safety door while running the manipulator.
4. Do not put the flower vase, water cup other watered containers on the manipulator body and the control box. If the water overflows, it can cause a fire hazard or an electric shock accident.
5. Do not put the metal product on the manipulator and the control box. If there are paper clips or staples and others enter into the internal part of manipulator from the air ventilation hole, it can lead to a short circuit of machine internal part, and cause a fire hazard or an electric shock accident.
6. Do not put heavy objects on the control box of manipulator. If there is an imbalance caused, it will make the manipulator fall down or make the heavy object fall down so as to lead to damage.
7. Do not use the spraying agent with a strong flammability, or there might be a fire hazard.
8. If there is leakage air from the air compression piping, pay an attention to be sure to stop the rotation of manipulator and remove the cause of air leakage.
9. When there is display of fault information, please refer to the description of fault information to take measures. If the status of manipulator is free of change like before after taking measures or there is an abnormality, please contact us.
10. Please confirm the following items before connecting the manipulator control power supply and main power supply:
  - 1) There are no personnel at a movable range of manipulator;
  - 2) The controller, tools and others are at their regulated position;
  - 3) The operating rack of manipulator is free of foreign matter.
11. If the following situations occur, please immediately stop the usage, cut off the control power supply and main power supply, and contact us. If you continue to use it, cause a fire.
  - 1) The main body or control box of manipulator has a smoke generation, or the outer side of machine is very hot.
  - 2) There is an abnormal sound sent;
  - 3) There are water and other foreign matters entering inside the machine.
12. If an abnormal occurs during the rotation of injection machine and manipulator, immediately press the emergency stop button. When there is display of fault information, please refer to the description of fault information to take measures. If the status of manipulator is free of change like before after

taking measures or there is an abnormality, please contact us.

13. Do not modify the manipulator main body and the control box; if you need modification, you are sure to consult with our company.
14. Do not move or tear off the note label plate or the note mark.
15. The air that contains the following substances can not be used. What is more, please confirm that the surrounding air is free of this substance. Please use clean air.
  1. organic solvents
  2. phosphate ester series of drive oil
  3. sulfurous acid gas
  4. chlorine gas
  5. degenerative compressor oil and so on
  6. acid
16. Please do not make the controller fall to the ground, and do not make it subject to a strong impact, or there might be a failure caused.
17. Please use the air fluid, and do not use other fluids.
18. Please do not hurt the compressed air piping, otherwise it will cause gas leakage.
19. While the arm declines to the internal part of mold to conduct a manual action, please be careful not to make the arm bring into contact with the mold.
20. Please use a correct air pressure, air pressure: 0.5Mpa (display pressure).
21. Please compile a safety reference manual for the manipulator action, and make operators comply with it.
22. When the manipulator is not used, please cut off the control power supply and main power supply of manipulator for safety. Be sure to unplug the power plug because the insulation deterioration may cause an electric shock or electric leakage
23. Never use wet hands to touch the power plug, or there will be an electric shock hazard.
24. While the control power supply of manipulator is on, do not unplug or insert into the power plug, or the plug will come about deforming and firing, or lead to a mechanical failure.
25. Do not make power wires come about rupture and injury. If you apply a heavy load, draw the power wires, or give an unwilling bending, there will be power wires damaged.
26. Please do not use the extension wires with insufficient capacity, or there are an abnormal, boiling hot, and smoke generation.
27. Never connect the earth wires in the following places.
  - 1) Gas conduit ( There is a danger of striking a fire and detonating);
  - 2) Telephone special earth wires and lightning rod (While lighting, there is a danger of flowing of a considerable amount of electric current. )
  - 3) Water pipes and taps (For water pipes, there might be plastic pipes connected in the midway, and the earth wires do not work).
28. In order to prevent electric shock accidents at the time of electric leakage, be sure to connect the earth wire. Please use the earth terminal that has been connected with the ground for construction to connect the socket with a ground wire.

29. While you connect the wires, please be sure to cut off the control power supply, or an electric shock or mechanical failure will be caused.
  30. Please clear the dust attached to the power plug or the socket, or because of the moisture and so on, there is a minimum current formed on the surface that will lead to burns or fire hazard.
  31. The protector should be set if the electrical wiring and air piping might be damaged.
- The main power supply of manipulator should be done by qualified electrical construction personnel, or the connection operation of manipulator wiring should be done by the personnel who have received a basic training of electrical construction and get a guidance of operators specified by the manipulator security manager.
33. After the installation is over and the manipulator works, be sure to confirm whether the source voltage is in accordance with requirements.
  34. Draw the main power supply of main power supply from different system of injection machine.
  35. Pay great attention to the connection of each connector because a wrong connection method will lead to a wrong action. Pay special attention to the connection of connector that connects the control equipment.

While you conduct a cleaning and maintenance, inspection, repair, adjustment of manipulator, be sure to cut off the control power supply and main power supply, and unplug the power plug. If you conduct a cleaning and maintenance of manipulator without cutting off the control power supply and main power supply of manipulator, it may cause an electric shock or unexpected accidents.

## **2. Notes of repair and maintenance**

- 1) Before you conduct a maintenance operation with a movable range of manipulator, please firstly cut off the control power supply and the main power supply and release the air pressure. Please write a prompt board of "It is prohibited to turn on the power supply before you conduct a maintenance operation."
- 2) While you conduct a maintenance operation with a movable range of manipulator, a mandatory administration of NO ENTRY should be done to prevent the personnel engaged in operation from entering into the movable range of manipulator.
- 3) The adjustment of mechanical part should be done after you stop the rotation of manipulator and cut off the control power supply and the main power supply. In addition, you do not adjust the manipulator while running.
- 4) Be sure to cut off the control power supply and the main power supply while you adjust the synchronous belt.
- 5) While you remove the screening check program, be sure to conduct under a state of discharging the air pressure.
- 6) If you conduct a setting, adjustment and repair of manipulator at a 2-meter height from the ground, a maintenance platform should be set.
- 7) The maintenance platform should be set stably with an enough space, arm rests or cover plate. In addition, you do not conduct operations such as the adjustment of manipulator while running.



- 8)The maintenance operation of manipulator should be done by operators who fill with mechanical, electrical knowledge and get an operation-related education and are appointed by safety administrator of manipulator.
- 9)Be sure to use genuine parts to replace parts.
- 10) Our company will provide a customer-centered safety education, technician education and novice education.

### 3.Warranty period

- 1)Within one year from the date of factory-leaving installation.
- 2)The total number of running is within 1,000,000 cycles, whichever comes earlier.
- 3)The warranty period can be specified otherwise with an agreement between our company and the client.

### 4.Non-warranty

- 1)The damage results from an operator's careless mistake.
- 2)The damage results from natural disasters such as earthquakes, typhoons, lightning, fire and so on.
- 3)The damage results from a self modification or bad adjustment.
- 4)Damage to consumption articles (See the blow list).

Item No.	Name	Warranty period
1	Gas scissors cutting head	300,000 cycles
2	Article aluminum	Wearing parts
3	hardware	Wearing parts
4	chuck	Wearing parts
5	Other fixture parts	Wearing parts

## II. Description of Manipulators

### 1. Manipulator specifications

(1) Representation method of machine type FP1550/1750-WS3

F	Servo series	P	Turret series	1550/1750	Arm stroke
W	Double stage	S	Product arm	3	Y、X、Z axis driven by servo motor

(2) Specification

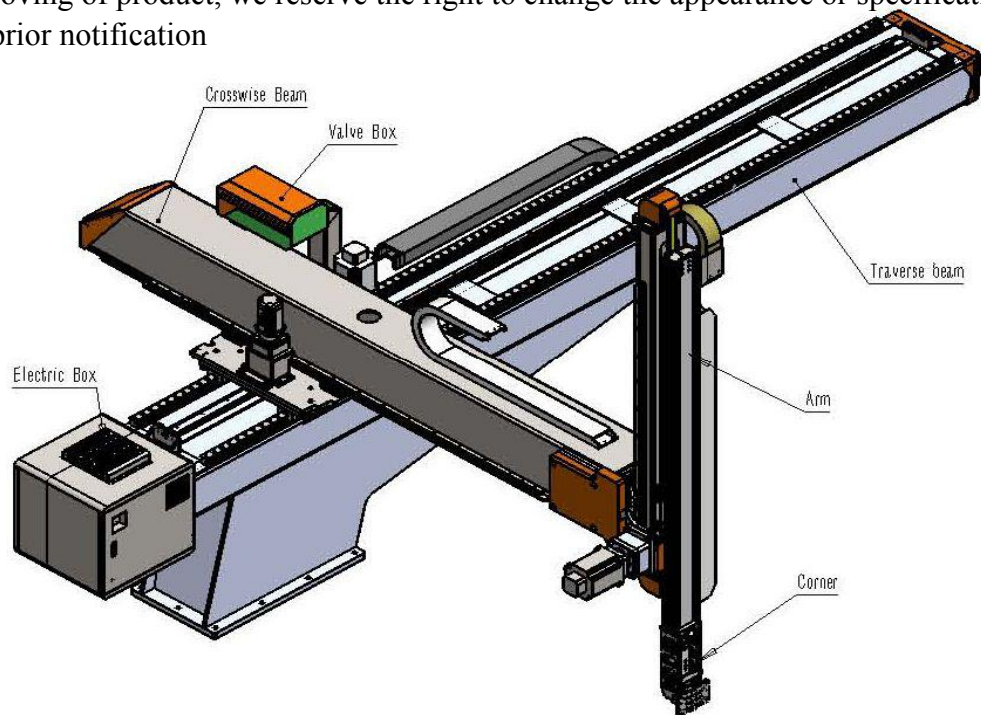
Model	Unit	FP1550-WS3	FP1750-WS3
I.M.M.range	Ton	850-1300	8500-1600
Type	Double-Stage(Speed type)		
Vertical Stroke(Y axis)	mm	1550	1750
Crosswise Stroke(X axis)	mm	1400	1550
Swing Stroke(Z axis)	mm	2250	2450
Max Load	Kg	50	50
Minimum Take Time	Sec	4.5	4.5
Dry Cycle Time(Without Tool)	Sec	15	15
Drive System	X、Y、Z-Servo Motor		
Working Air Pressure	Kgf/cm <sup>2</sup>	5~7	
Air Consumption	nl/cycle	30	
Power	KVA	14	
Power		AC220V ± 10% 50/60HZ	
Net Weight	Kg	850	900

●The measuring basis of dry cycle time is below:

All the delay time is set to zero, full vertical stroke and 100mm of crosswise stroke. During the actual production and take-out, as the condition is different, we can not ensure to meet the above-mentioned period of time.

●Because we keep improving of product, we reserve the right to change the appearance or specification of our product without prior notification

**2. Description**





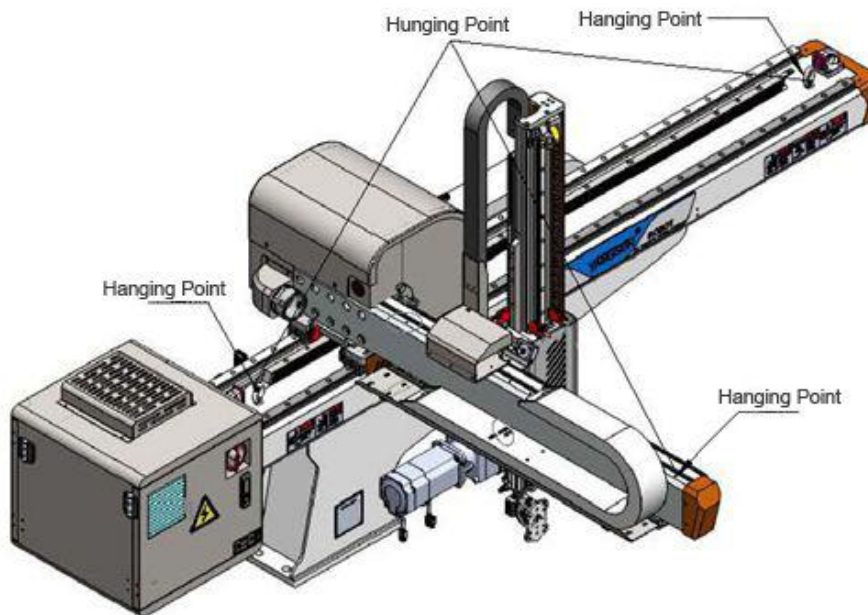
### III. Installation

#### 1. Installation Size

The robot is fixed on the injection molding machine, the installation size is up to the distance between the holes on the platen of the injection molding machine.

#### 2. Portage

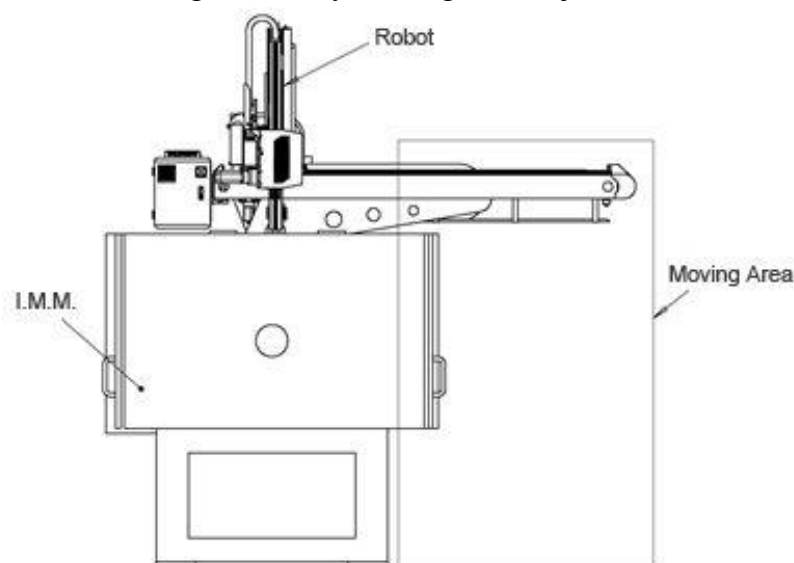
Move the arm closed to crossbeam.



**【NOTE】** While you conduct a conveying with a stacking machine or manpower, pay attention to the center of gravity, and do not fall heavily.

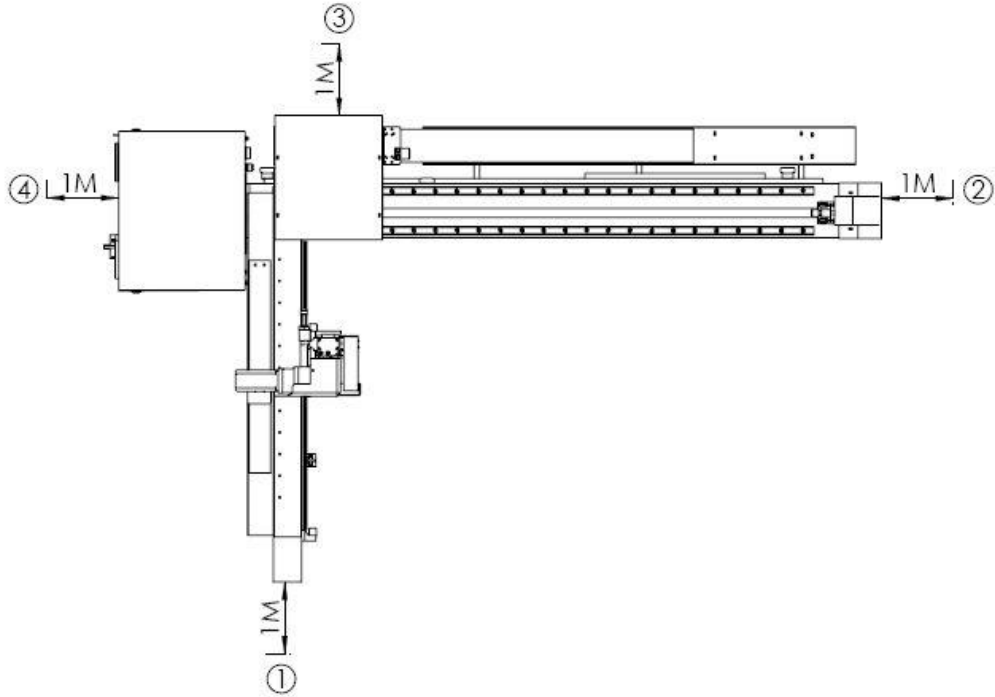
#### 3. Protective Zone

Do not enter into the movable range during operation of manipulator. A movable range of manipulator is shown below. Please set a safety range to keep persons out of the movable range. If you enter into the safety range during an automatic running, there may be danger of major accident.



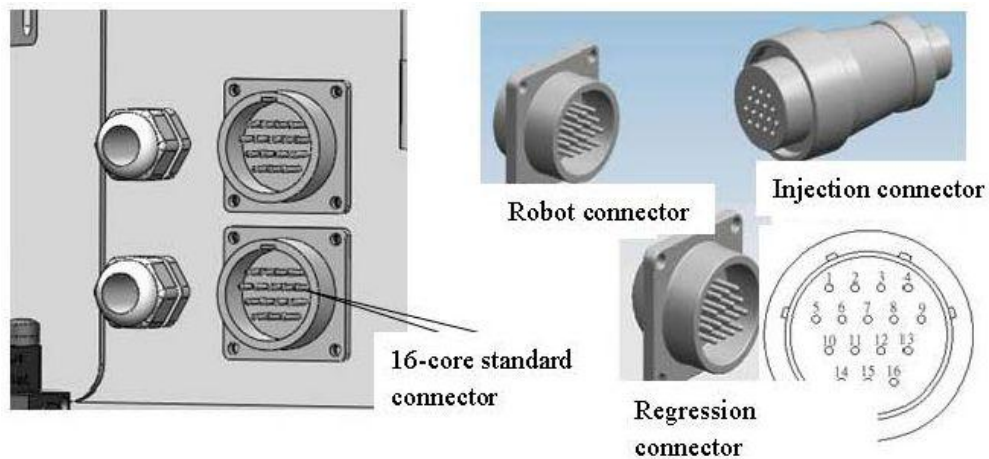
### 4. Test list of noise level

- (1) The noise test is done under the noisy environment of 60dB (A) .
- (2) Noise level list of equipment type RION NA-24.
- (3) The test point is 1M away from the manipulator and 1M high from the ground.
- (4) The type of test machine isFG1100-WS3, and it is applicable to manipulators of other machine types.
- (5) The testing position is shown in the below diagram:



Noisy tested point	1	2	3	4
Noisy dB (A)	67	65	67	68

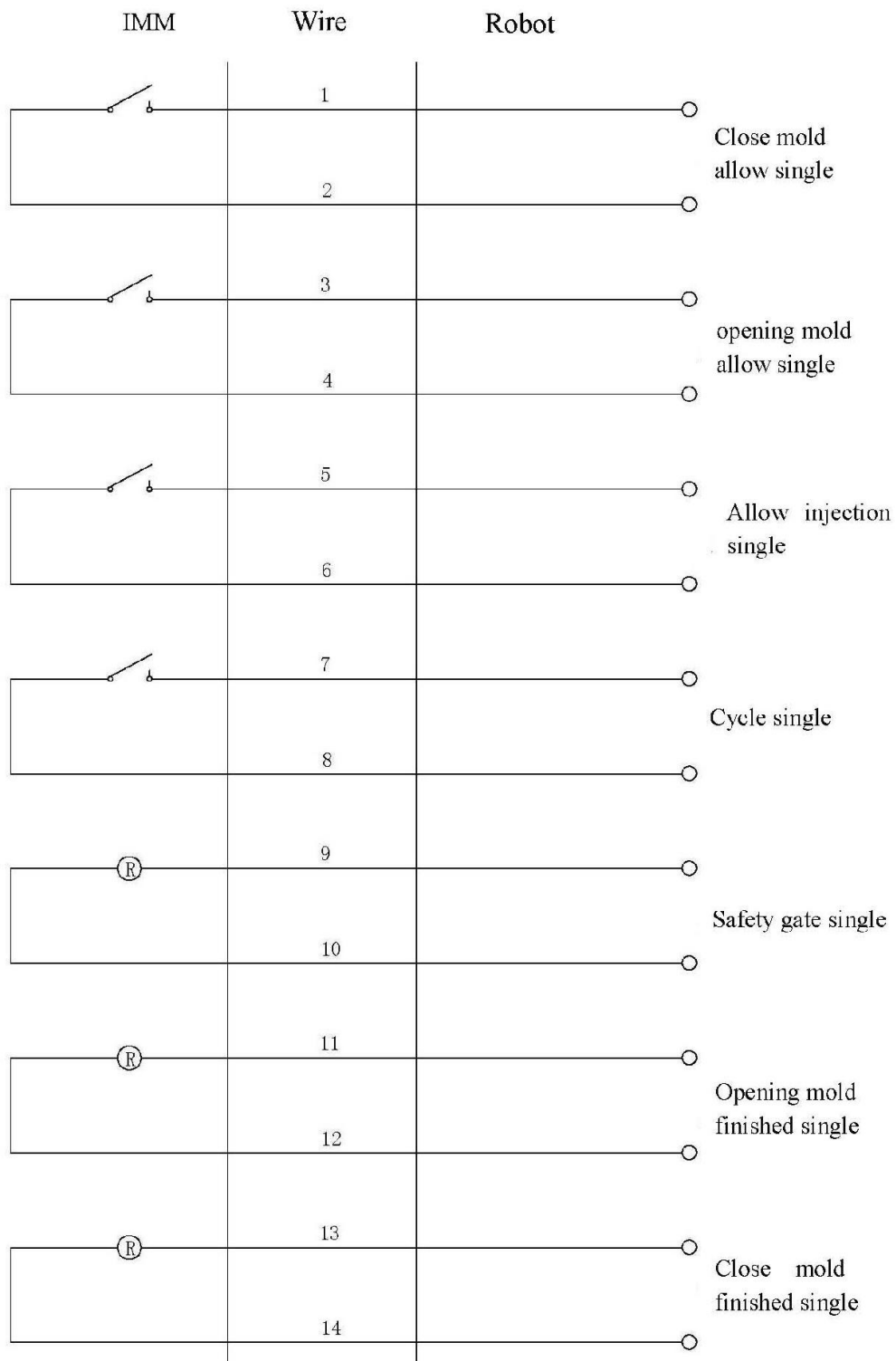
### 5. Connected with IMM



## Contact description

1, 2	manipulator signal	When the manipulator moves upward to the upper signal (LSI) after a successful fetching in the mold, the contact is closed to allow a starting of mold opening of injection machine. If the alarm occurs when the manipulator is acting, the action of mold closure will be interrupted.	
3, 4	cycle start	The action situation of this contact is the same as the No. 1,2 manipulator signal (START).	
5, 6	thimble enabling	When the manipulator allows the advance of injection-machine thimble, the contact is closed. Please refer to the operation description of electric control part for the control of thimble.	
7, 8	Recycling	Allow the injection molding machine runs circularly.	
9, 10	safety door	When the injection-machine safety device (such as the safety door, protection safety equipment, foot-board safety equipment and so on) acts, the contact must be closed, so there may be a dangerous action. Moreover, this signal must act under any operation mode. According to the EN201 regulation, this safety /device signal contact must use the limit switch series, and the current capacity is not more than 10A.	
11, 12	Mold opening completion	When the mold opening position of injection machine is equal to the required position where the article is fetched. The occurrence of the situation that you do not notice that the stroke of mold opening is smaller than the required position where the article is fetched must be strictly prohibited. The contact must keep closed status, and this signal can not be interrupted because the operation mode of injection mode is changed or the safety protection device (such as the safety door) is opened.	
13,14	Mode Locking Finished	The injection molding machine closes mould to finish outputs signal.	
3-core wire	brown	L	Power supply (1Φ 220-240V 50/60Hz) live line (L)
	blue	N	Power supply (1Φ 220-240V 50/60Hz) zero line (N)
	yellow	PE	Power line ground (PE)

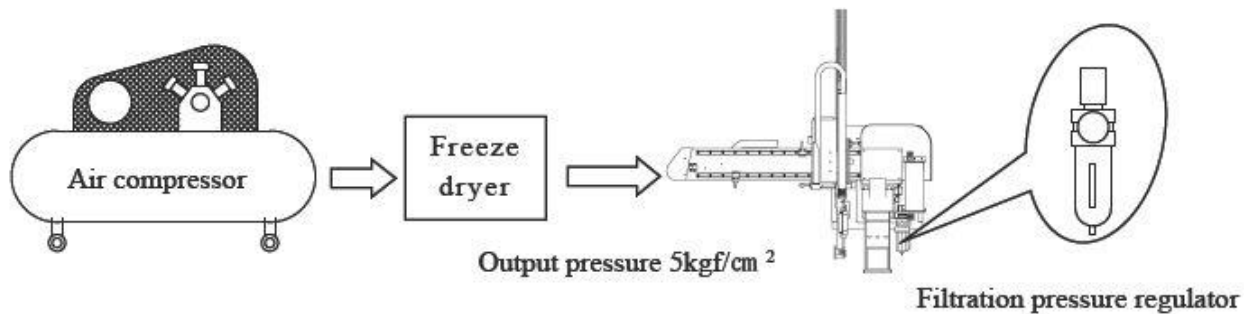
The wiring diagram for the robot arm connects to the injection molding machine as below,



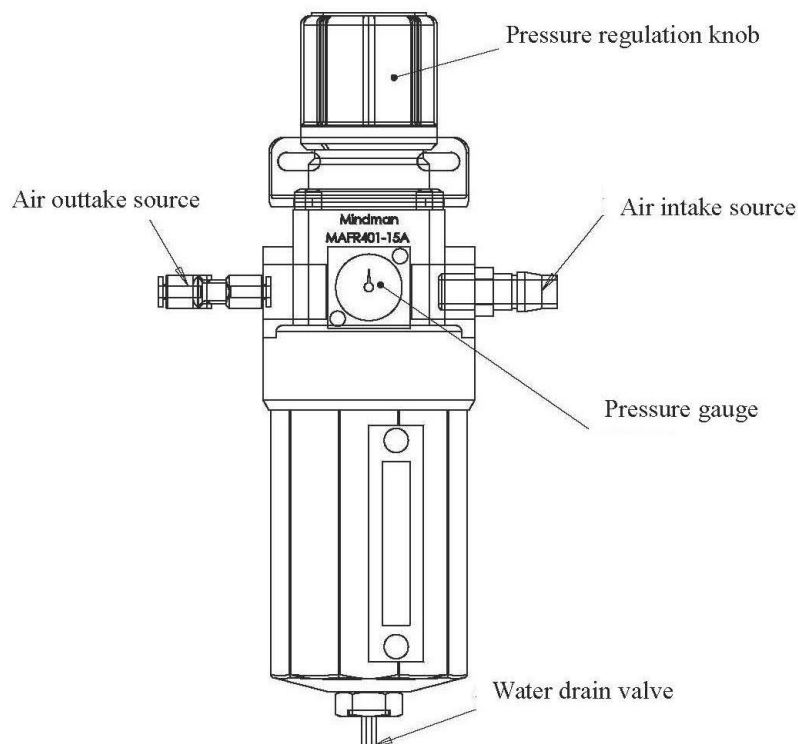
## 6. Air source connection

### (1) Air source supply configuration

In order to maintain a normal operation of machine, please add a freeze dryer at the exit of air compressor to remove the wet heat water content in the air to maintain a normal service life of manipulator.



### (2) Air source connection



- a. If the air source is too far away (more than 10m), please use hard tubes to reduce the pressure loss.
  - b. Connect the air source, and adjust the double-point combination to reach 5kgf/cm<sup>2</sup>
- Give a daily inspection of accumulation water of filtration pressure regulator, and give a daily drainage.

## 7. Connection safety and function test

※When the installation of manipulator and injection machine is completed as per 1-6 in this section, you must check the safety function of manipulator by followings.

- (1) Enabled mold closing signal
- (2) Regression signal of safety door
- (3) Mold opening completion signal
- (4) Speed adjustment
- (5) Regression detection
- (6) After the finished product is taken out, you may lock the mold.

**【NOTE】 Do not do connection test if you do not get a professional training, and if there are any questions, please notify our company.**

## 8. Manipulator removing steps

- (1) Turn off the power supply of injection machine.
- (2) Turn off the power supply of manipulator.
- (3) Shut off the air pressure source of manipulator.
- (4) Discharge the air pressure.
- (5) Loosen the fixed screws of extraction cylinder fixed plate. And move the arm to make it close to the arch.
- (6) Move the buffer seat to make it close to the arm.
- (7) Rotate the fixed plate of extraction cylinder to make the arm incapable of movement.
- (8) Remove the manipulator.
- (9) Remove the connecting wires of injection machine.
- (10) Connect the joint of resetting (short circuit).
- (11) Unplug the power wire of arm.
- (12) Clear up the injection machine connection wires and power wires.
- (13) Remove the fix screws of machine base.
- (14) Remove the mechanical arm.

# IV. Setting and adjustment before start up

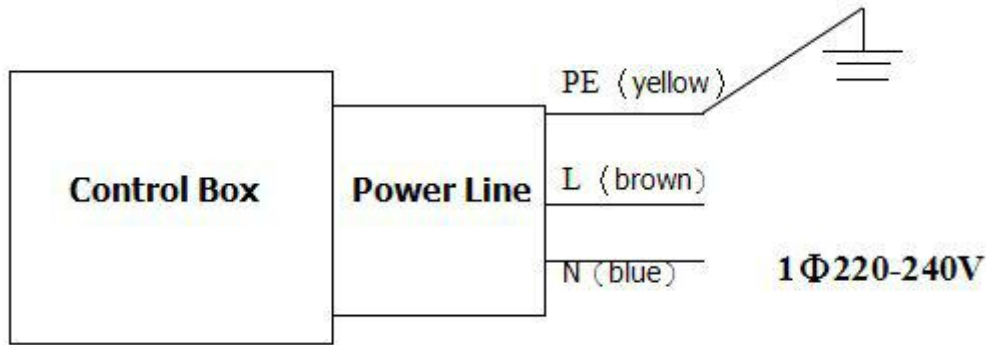
## 1. Injection-machine connection

Before using the manipulator, you must connect with the injection machine, connect the joint to the interface of injection-machine manipulator.

※IMPORTANT NOTES: when the manipulator is not used, you may directly turn off the power supply or mount a short circuit joint.

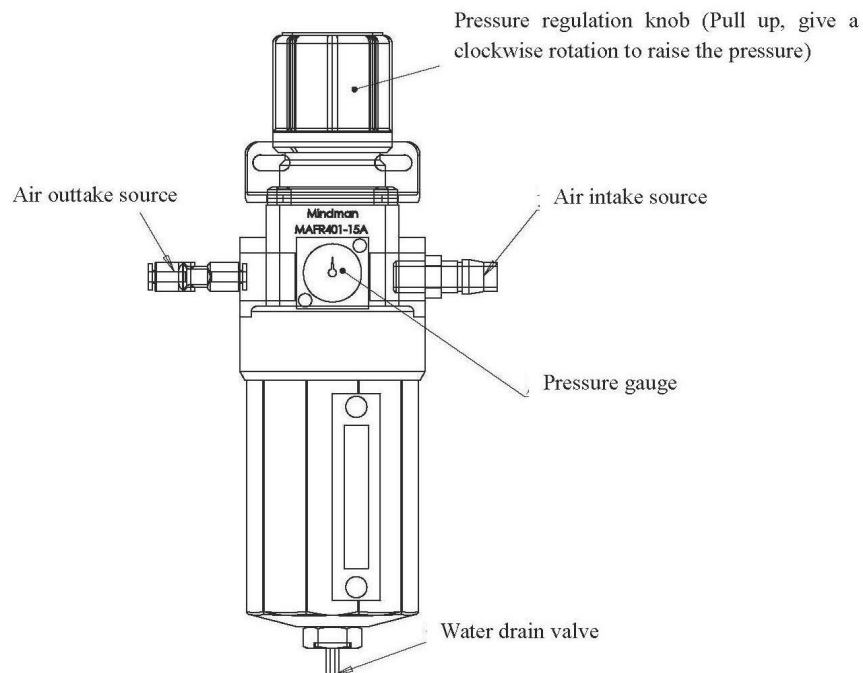


## 2. Power supply connection



NOTICE: ( 1 ) Power supply connection to the injection molding machine power on the terminal of manipulator .

## 3. Air source connection



(1) Connect the air pressure source according to the drawing, note that the indication position of pressure gauge should be located between  $5\text{Kg}/\text{cm}^2 \sim 7\text{Kg}/\text{cm}^2$

(2) Pay attention to the water level of double-point combination every day, and a periodic drainage should be given every day, and the line of full water.

(3) Pull the pressure adjustment knob upward with a small force; in case of clockwise rotation, the pressure will become big, and in case of anticlockwise rotation, the pressure will become small.

### 4.Source rogram of turning on power supply

(1) Turn on the power supply switch after the injection machine signal lines have a good connection.

**【NOTE】** Before the power supply is turned on, firstly confirm that the connection wires of operator and control box.

(2) After the power supply is turned on,

(3) If there is no display after the power supply is turned on, it is capable of fuse burnout. You should check the fuse at first, and if no fault with the fuse, notify our company.

(4)Please press the E-Stop switch (like the picture follow)when there is emergency to stop the robot.



### 5. Adjustment after Mold Changing



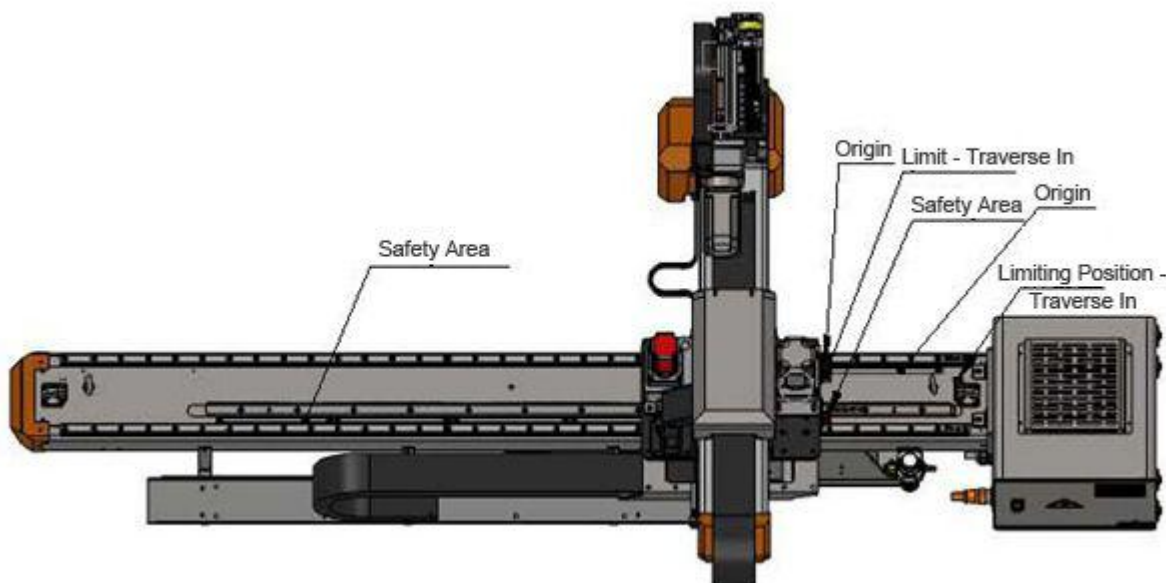
**【Notice】** please notice the following point when adjust the robot after mold changing:

※please don't make any operation if you have not been trained.

※please open the safety gate after the IMM finished mold opening.

**【Important】** : You can't adjust the robot before finished the operation below.

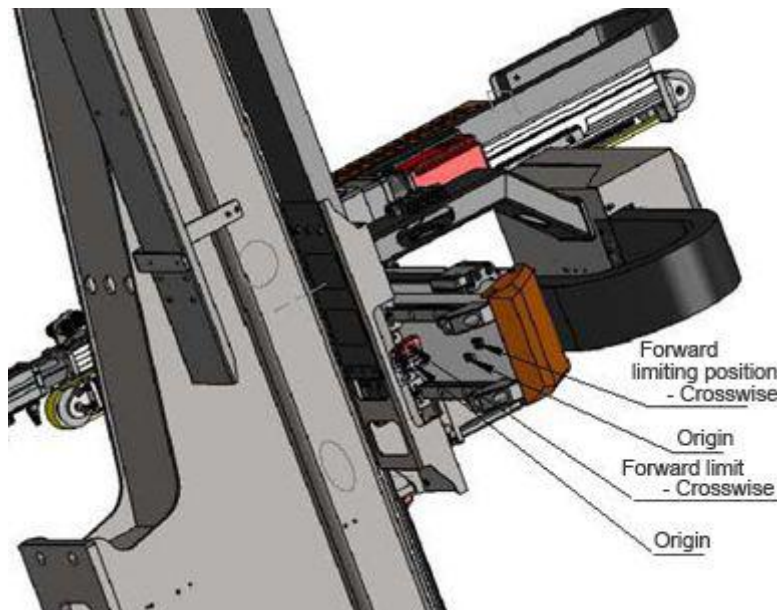
(1) Adjustment for Traverse Stroke



**program:**

- A. Turn on controller, rotate the state selection button to manual state, then click “teaching” button to enter teaching page.
- B. Select “Axis action” to set up the position, delay time and speed of traverse beam, then click to save. Please note the limiting position. Rotate the button of phase selection to automatic status and adjust to the appropriate location.
- C. Please refer the instruction of control system for specific operation.

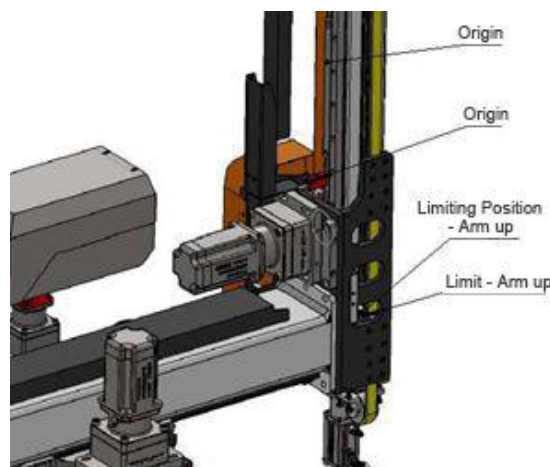
(2) Adjustment of Crosswise Stroke



**program:**

- A. Turn on controller, rotate the state selection button to manual state, then click “teaching” button to enter teaching page.
- B. Select “Axis action” to set up the position, delay time and speed of crosswise beam, then click to save. Please note the limiting position. Rotate the button of phase selection to automatic status and adjust to the appropriate location.
- C. Please refer the instruction of control system for specific operation.

(3) Vertical Stroke Adjusting



**program:**

- A. Turn on controller, rotate the state selection button to manual state, then click “teaching” button to enter teaching page.
- B. Select “Axis action” to set up the position, delay time and speed of vertical beam, then click to save. Please note the limiting position. Rotate the button of phase selection to automatic status and adjust to the appropriate location.
- C. Please refer the instruction of control system for specific operation.

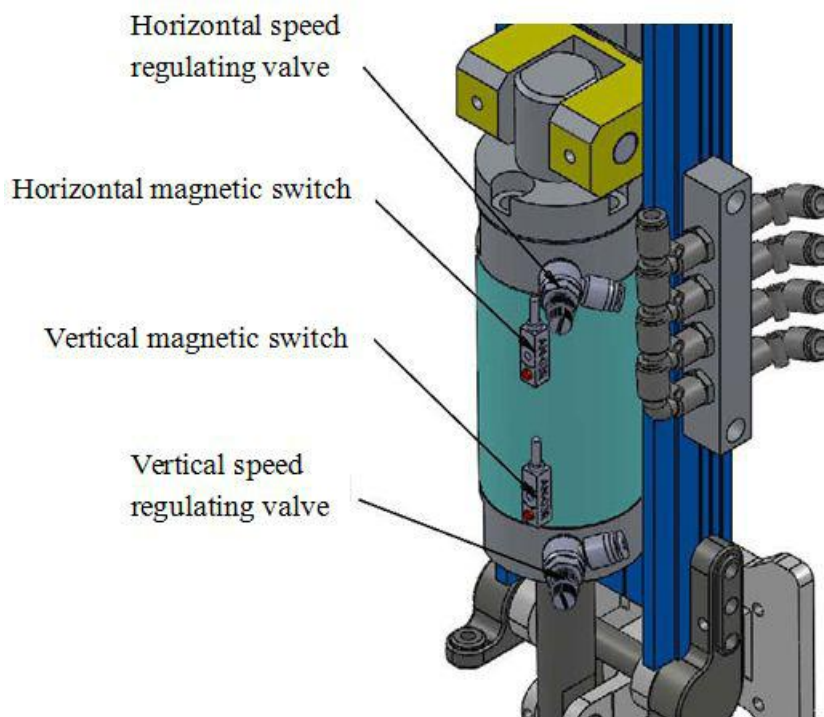
**6. Working Speed Adjustment**

(1) Up and Down speed of the traverse beam and the crosswise adjustment.

Please refer the part of “Manual parameter part” on the controller manual for setting.

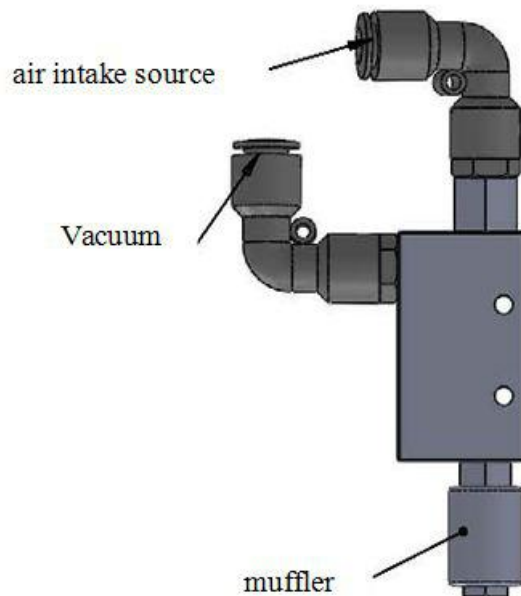
As for the specific manual you can refer to the specification

(2) Corner group speed adjusting

**program:**

- A. When changes the speed of horizontal/vertical of the corner, please adjust the speed regulating valve of horizontal/vertical properly.
- B. Speed down-clockwise rotation; Speed up-counterclockwise rotation. Please lock the screw after adjustment.
- C. When there is not signal of the horizontal speed regulating valve, adjust the position of horizontal magnetic switch by up and down till the lamp lights up, lock the screw.
- D. When there is not signal of the vertical speed regulating valve, adjust the position of vertical magnetic switch by up and down till the lamp lights up, lock the screw.

## 7. Vacuum Generator



※Because the vacuum generator is easy to come about clogging, it should be periodically removed to clean its internal part.

## V. Maintenance

### 1. Security of maintenance

※ **【NOTE】** Before and during repairing the manipulator, please read the following rules to avoid danger.

- (1) Before examining and repairing the injection machine, please turn off its power supply.
- (2) Before adjustment and repair, please turn off the power supply of injection machine and manipulator, and remove the residual pressure of manipulator.
- (3) Except proximity switches, bad suction and clamping, solenoid valve that may given a self-repair, the others should be examined and repaired by professionally trained personnel, or do not change by yourself without approval.
- (4) Please do not replace or alter any original parts.
- (5) Please pay attention to safety to avoid being hit by the manipulator during adjustment or replacement of mould.
- (6) Please leave the hazardous area after completing the adjustment or repairing manipulator and before testing the machine
- (7) Do not turn on the power supply or connect the air source during maintenance process

### 2. Inspection items and periods of maintenance

Inspection items and periods of maintenance are shown in the blow list, please be sure to implement:

Company address: the first floor, building B, yuechang industrial park, songbai road, shiyang town, baoan district, shenzhen city, guangdong province, China

Item	Scope of inspection	Period
1	Confirm if the sucker, clapper and tool are normal in function	every day
2	Water drainage of air compressor	every day
3	Fix screw of tool	every day
4	Air compressor drainage	every day
5	Injection-machine connecting wire,manipulator connecting-wire joint	every day
6	Check if the machine parts are loose	every day
7	Lubrication of extraction guide rod and bearing	every week
8	Lubrication of downward-movement slide rail and sliding block	every month
9	Check if pneumatic-tube coupling and the speed regulation knob are normal	every month
10	Cleaning and clearing up of outside appearance	every week
11	Functional check of vacuum generator	every month
12	Inspection of machine-base fix screw	every month
13	Functional check of oil buffer	every month
14	Replacement of pneumatic tubes and electrical wires & cables	3 years

**3. General table of repair & maintenance tools**

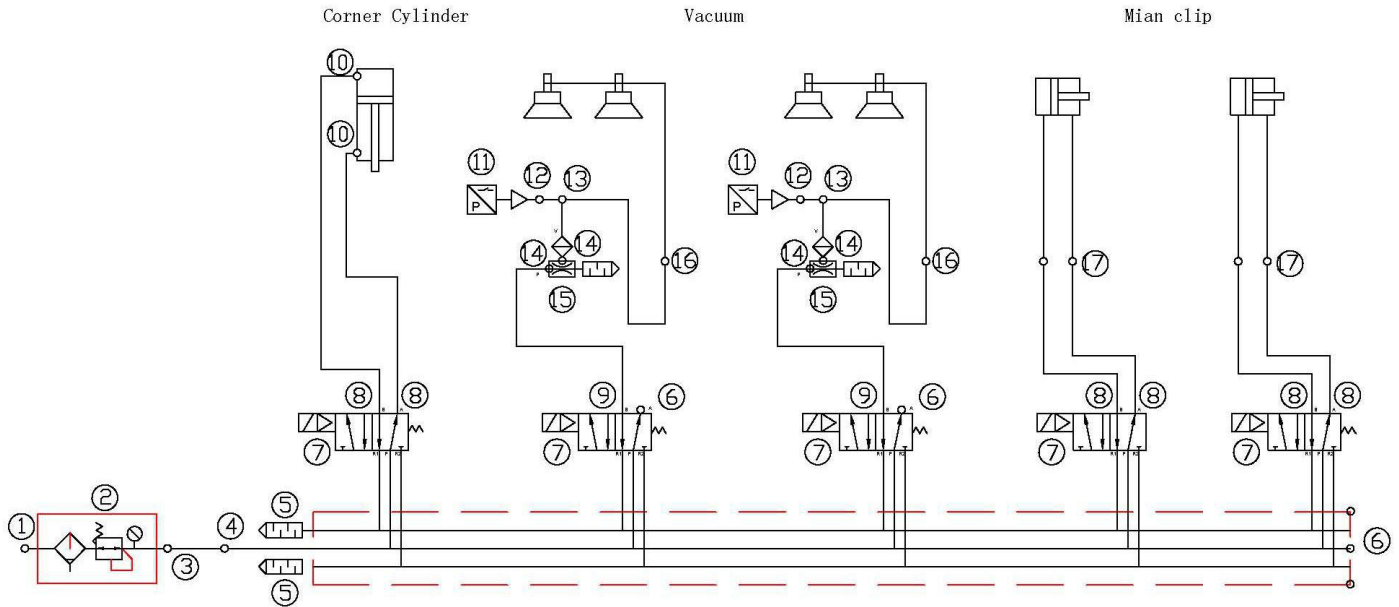
- (1) Hexagon spanner from 2.5 to 8mm                      (2)Adjustable spanner from 8 to 14mm
- (3)Cross screwdriver and fathead screwdriver
- (2) Diagonal pliers and sharp nose pliers
- (5) Universal meter    (6) Air spray gun    (7) Oil gun

**4. Lubrication**

- (1) Supporting parts used by this machine are straight line slide rails and linear bearings with steel balls or composite material inside, and their frictions are a rolling friction or sliding friction. If there is no lubrication, the friction loss of contacting part will rise so as to reduce the service life, so a timely lubrication should be given
- (2) Lubricating time: A lubrication of oil injection should be given every about 50,000 times or every month.
- (3) Grease category: consistent grease or soap base lubricating oil No.2 series
  - a. ISEVG32-68.....or transparent lubricating oil:
  - b. ALVANIA GREASE NO.2                      (SHELL brand)
  - c. ALVANIA EP/2                                      (SHELL brand)
- (4) Lubrication position:
  - a. Upper/lower guide rail, sliding block
  - b. Extraction guide rod, bearing
- (5) Lubrication mode:
  - a. Sliding block: Crush the oil in to the sliding block to lubricate the internal part.
  - b. Slide rail and bearing: Oil the surface with brush.
- (6) Do not need lubrication as the pneumatic cylinder of this machine adopts an oil supply-free type cylinder.



# Air Pressure Circuit Diagram



## Parts list

Item	Name	No.	Q	remark
1	Air pipe joint	68100004	1	
2	Filter regulator	68030009	1	
3	Straight tube with outside	61010410I	1	
4	Male elbow	61030210L	1	
5	Muffler	68050005	2	
6	Copper plug	68080008	4	
7	Magnetic valve	62061020101	3	
8	Straight tube with outside	61010204I	4	
9	Straight tube with outside	61010206I	1	
10	Pipe lined speed regulating valve	61060104T	2	
11	Vacuum switch	5105DPA10M-P	2	
12	Straight tube with inside	61020106I	2	
13	Without teeth three link	61050006Y	4	
14	Male elbow	61030206L	4	
15	Vacuum generator	68040004	2	
16	Partition through	61090606I	8	
17	Without teeth three link	61050004Y	4	

**NOTICE : We wouldn't inform you whenever we need to change the robot model .**

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