SCB-PB Passive Pneumatic Controller

User Manual

Version：CV1.0

Soft Robot Tech Co.,Ltd

Safety notes

Before starting to use this product, please read carefully the safety precautions and user ' s notices to prevent personal injury or property damage to oneself and others. This product is equipped with SRT flexible end fixture, and it should not be used for other purposes.

Warning!

About working environments of the product.

- Do not use in environments distributed with corrosive gases, chemicals, seawater, water and steam.
- Do not use in places distributed with explosive gases and dust.
- Do not use in places prone to vibration or shock.
- Do not use in places around heat sources or radiation heat sources.
- If the product is used in places with water drops, oil and welding sparks, appropriate protecting measures must be taken.

Contents

1. Product introduction

SCB-PB series passive pneumatic controller is a special pneumatic drive controller for SRT flexible end fixture, which can output adjustable air pressure of 60~100 kPa. Under the trigger of external equipment, the flexible end fixture is driven to perform opening and grasping actions, the positive pressure output corresponds to the clamping action, and the negative pressure output corresponds to the opening action of the fixture. The controller can be conveniently equipped with flexible end fixture and other automation equipment to form a flexible grasping system.

Functional characteristics :

1、Real time status display :

The SCB-PB series controller is equipped with pressure display and indicator lamp. The pressure display can display the real-time pressure value and set pressure of the air pressure output port, and the indicator lamp can display the current working state of the controller.

2、Accurate high speed response

The SCB-PB series controller optimizes the previous generation controller control system, which can adjust the output pressure more accurately and quickly, and achieve the set output pressure value in a short time to meet the requirements of certain specific working environment.

3、Manual adjustment of set pressure

SCB-PB series controllers are equipped with adjusting knobs, which can adjust the setting pressure of grasping and opening respectively, so it is convenient, simple and saves time.

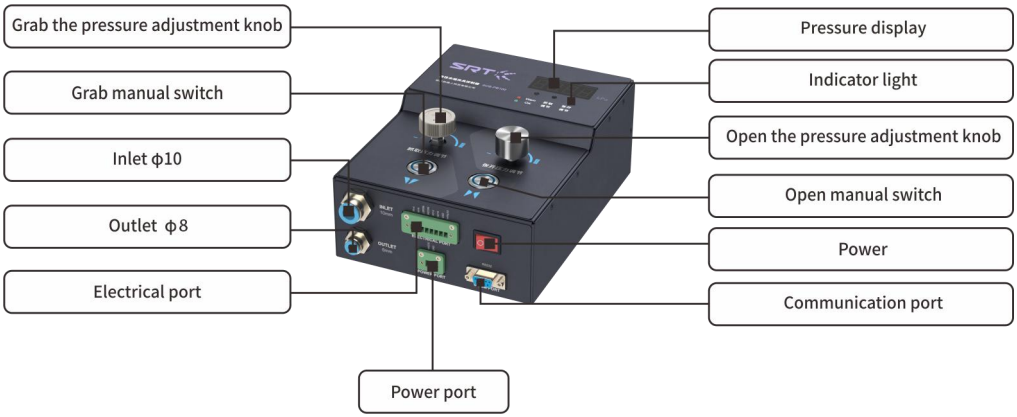
4、Fault alarm function

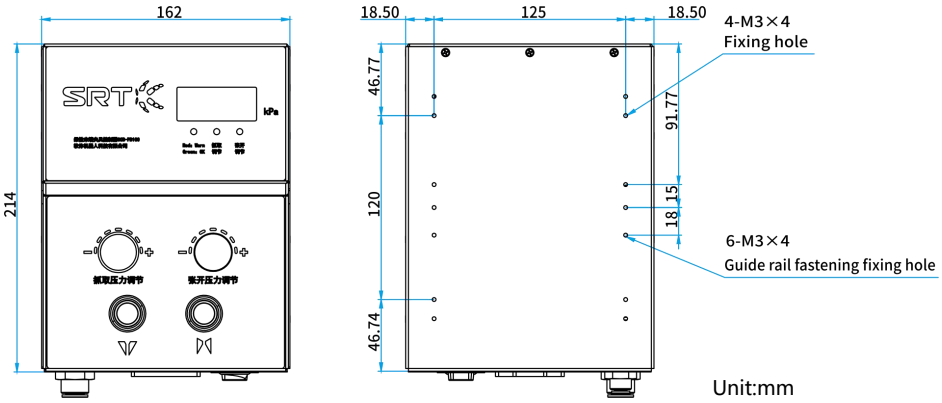
The SCB-PB controller will detect the output pressure in real time. When there is air leakage in the end fixture, the indicator light will become red, and the control system will output signals to facilitate the operator or the external control system to make judgments and improve the reliability of the production line.

1.1 Packing list

Name	Amount
Controller	1
User manual	1
Filter	1
DB9 Data Line	1
10mm pipe	1
35mm Guide rail buckle	2
Fixed connectors	4

1.2 Panel introduction and size





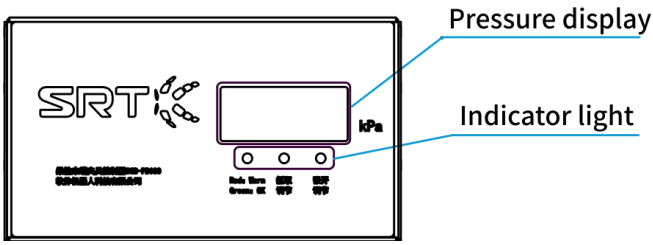
Name	Function introduction
Power	Controller power supply switch
Pressure display	Display content
Pilot lamp	Status Display
Communication interface	DB9 interface, MODBUS-RTU protocol
Manual switch	Manually switch the grabbing/opening state
Intake port	Connect to air source through φ10 pipe
Outlet port	Connect the end fixture via φ8 pipe
I/O interface	Input and output I/O
Power connector	DC 24V power supply access

1.3 Technical Parameters

Name	Specification
Dimensions	214*162*86mm
Net weight	2.5kg
Protection level	IP42
Rated voltage	DC24V±10%
Rated current	2A
Input air pressure range	0.5～0.7MPa clean air source, flow >300L/min
Output pressure range	-60～100kPa
Output positive pressure flow	200L/min
Output negative pressure flow	80L/min
Protective function	Leak detection, completion & alarm output, overpressure protection
Control method	I/O signal, software control, communication control
Pressure regulation method	Manual pressure regulation
Cooling method	Natural cooling
Working environment	Avoid large amounts of dust, oil and corrosive gases
Ambient humidity	<85%,RH(No dew and beads)
Ambient temperature	-10～50℃（Not frozen）

2. Function Description

2.1 Display function



Display features include pressure display and indicator light

1、Pressure display ：

Display the real time output pressure value of the current air outlet; display the set pressure during grabbing and opening debugging; alarm information.

2、Indicator light：

Indicator lights are : completion / alarm instructions, grab adjustment instructions and open adjustment instructions.

Complete / alarm instructions, when the end fixture completes the grab or open action, the indicator lights green. When the controller detects that the air inlet interface pressure does not reach the input pressure range, or the end fixture cannot complete the operation normally, the indicator light is red.

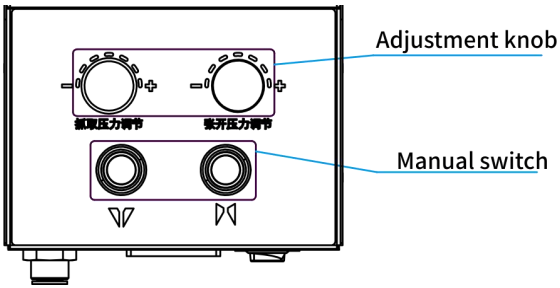
Grab adjustment indicator : When the controller is in the initial state, when the ' grab pressure adjustment ' button is rotated, the indicator light is green. After stopping the rotation of the ' grab pressure adjustment ' button for 2 s, the indicator light is extinguished.

Opening adjustment indicator : When the controller is in the initial state, when the ' opening pressure adjustment ' button is rotated, the indicator light is green. After stopping turning the ' open pressure adjustment ' button for 2 s, the indicator light is extinguished.

Note : Initial state : normal power supply, air circuit seal, intake pressure to meet the requirements, the controller without air pressure output state

2.2 Manual control

Manual control includes manual switch and adjusting knob, as shown below :



Manual switch :

It includes grab switch and open switch, which are used to switch the pressure state and reset controller of the outlet interface. Press the grab switch alone, the outlet interface will output positive pressure, drive the end fixture to grab state. Press open switch alone, the outlet interface will output negative pressure, drive the end fixture to open state. At the same time press the grab switch and open switch, the outlet interface output zero pressure, the end fixture to restore the natural state.

At the same time press the grab switch and open switch, reset the controller, clear the alarm state.

Adjustment knob ：

Including grasping pressure adjustment knob and opening pressure adjustment knob. When the controller is in the initial state, the set pressure of grasping or opening can be changed by rotating the pressure adjustment knob.

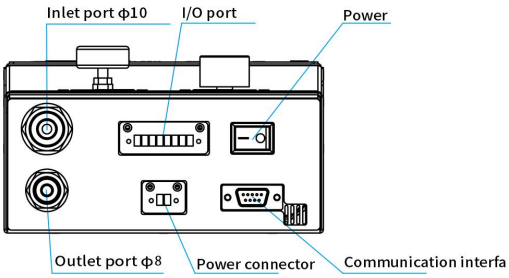
When rotating the grab pressure adjustment knob, the grab adjustment indicator light is green, and the pressure display area displays the grab

pressure setting value. After stopping the rotating knob for 2 seconds, the pressure display area switches to display the air interface pressure. The counterclockwise rotation reduces the setting pressure, and the clockwise rotation increases the setting pressure.

When the pressure adjustment knob is rotated, the opening adjustment indicator light is green, and the pressure display area shows the setting value of the opening pressure. After stopping the rotating knob for 2 seconds, the pressure display area switches to display the air interface pressure. The counterclockwise rotation reduces the setting pressure, and the clockwise rotation increases the setting pressure.

2.3 Input-output

Input and output functions include inlet and outlet interface, power interface and I / O interface.



Inlet port: INLET, suitable for air pipe with an outer diameter of 10mm.

Outlet port：OUTLET，suitable for air pipe with an outer diameter of 8mm.

Power port : POWER PORT, DC 24V ± 10 % input, power greater than 50W.

I / O port : ELCTRICAL PORT, at the input and output signal connection, from left to right is IN-P, IN-N, IN-RST, IN-COM, OUT-P, OUT-N, OUT-EER and OUT-COM.

The corresponding functions are as follows：

IN-P	Grab trigger input
IN-N	Open trigger input
IN-RST	Reset trigger input
IN-COM	Input COM
OUT-P	Grab complete output
OUT-N	Open to complete the output
OUT-EER	Alarm signal output
OUT-COM	Output COM

Function Description ：

1) **Power port:** voltage range DC24±10%, power supply rated power greater than 50W
2) **I/O port-input port** :

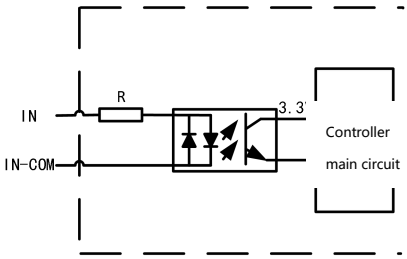
The robot or PLC can output positive pressure, negative pressure, maintenance and zero pressure by using I / O signal to control the outlet interface of the controller through this port.

Usage : Connect the IN-COM port of the controller to the COM of the output terminal of the control model of the robot or PLC. When the logic signal of the IN-P port is 1, the controller performs the positive pressure output and the end fixture is the grab state. When the IN-N logic model is 1, the controller performs negative pressure output, and the end fixture is open. When IN-P and IN-N are both 1, the controller performs pressure relief action and the flexible gripper is in natural state. When the reset port logic signal is 1, the controller is reset state, clear alarm information, etc., and restore to the initial state.

IO trigger voltage is 24V ± 5 % (current over 100mA). The corresponding relationship between I / O signal and action is as follows :

State logic signal port	IN-P	IN-N	IN-RST	IN-COM
Maintain current status	0	0	0	GND/VCC
Grab action	1	0	0	GND/VCC
Open action	0	1	0	GND/VCC
Pressure relief action	1	1	0	GND/VCC
Reset	0	0	1	GND/VCC

The schematic diagram of the input port is as follows:



3) **I / O port – output port:**

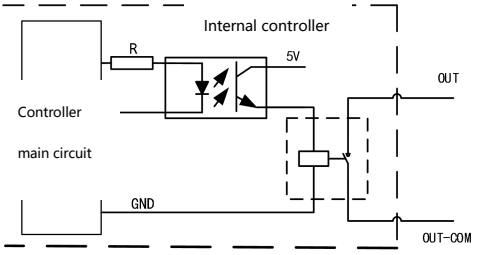
Complete the output : When the SCB-PB series controller detects that the end fixture completes the grasping or opening action, the corresponding port and OUT-COM will be turned on. The robot or PLC can judge whether the end fixture completes the grasping or opening action by whether it is turned on or not.

Alarm output : When the SCB-PB series controller detects the leakage of the end fixture, the OUT-ERR port and OUT-COM port will be turned on. Robot or PLC can judge whether the end fixture has leakage by whether it is turned on or not.

Ports and functions correspond as follows :

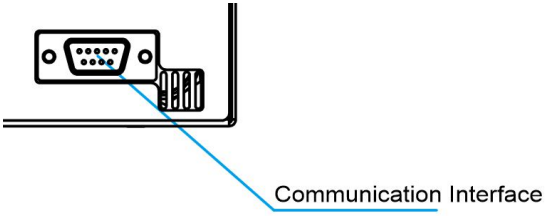
State output signal port	OUT-P	OUT-N	OUT-ERR	OUT-COM
Grasp completed	1	0	0	GND/VCC
Open finish	0	1	0	GND/VCC
Alarm status	0	0	1	GND/VCC

The schematic diagram of the output port is as follows:



2.4 Correspondence function

SCB-PB series controller supports one kind of communication interface : DB9.。The location is as follows:



The communication protocol is MODBUS - RTU.

Users can view parameters by connecting SRT debugging pressure software with DB9 data line.

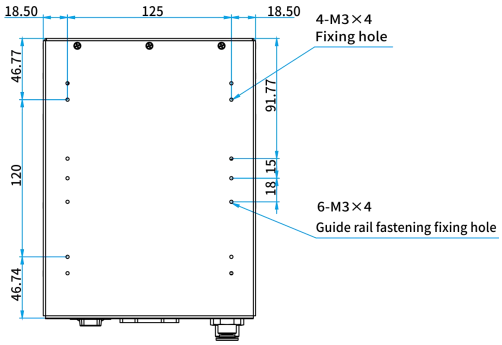
The communication function of SCB-PB series controller only supports communication triggers such as grabbing and opening, and the controller setting pressure cannot be modified.

Communication Function Its Communication Protocol Reference 《 SCB-PB series controller communication protocol description 》 Document.

3. Installation

3.1 Mounting and fixing

The installation hole of SCB-PB series controller is located at the bottom of the controller, and the size is as follows. Please use M3×4 bolts when installing.



Installation Precautions ：

1、When the equipment is installed, ensure the equipment is installed firmly.。

2、When fixing equipment, don 't squeeze equipment into or out of the air tube or wire。

3、Please do not suspend the controller to a high position to avoid the controller damage caused by falling.。

4、Installation of controller grounding in special environment, such as strong magnetic interference environment。

3.2 Pneumatic connection

Before pneumatic connection, SCB-PB series controller should be in a safe position, fixed well, to prevent falling, not placed in the sealed box. Ensure that the length of φ10mm intake pipe is enough to reach the controller intake interface. The φ 8 mm outlet pipe should be connected with the end fixture after the filter, and the total length is within the range of 3 – 5 m.

Ensure that the trachea is fully inserted into the fast insertion joint when connecting the gas path. During the insertion, there is a clear sense of frustration to prove the correct connection of the trachea.

After the pneumatic connection, open the industrial gas source, press the manual switch, try to run three to five times, to ensure that the pneumatic connection is good. If air leakage is found, air leakage should be eliminated immediately and can be continued after solution.

Notes on Airway Connection:

1、Fully blow or wash the end, oil and dust of the pipe before piping.

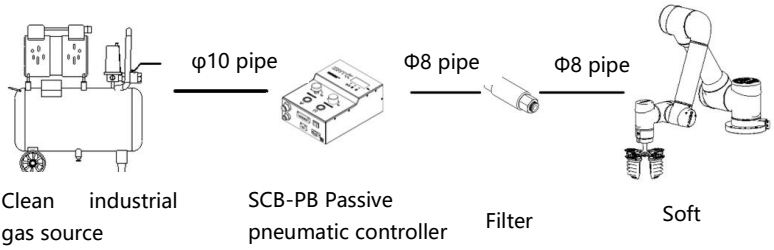
2、When the controller is connected to the trachea, the bending and blockage of the trachea are avoided as far as possible, otherwise it is easy to cause the instability of the pneumatic system of the controller.

3、Do not make mistakes in product inlet and outlet.

4、Ensure the air tightness of the product outlet to the end actuator trachea.

5、Series filter can ensure the service life of the end fixture and pneumatic controller, and the filter should be between the controller and the end fixture.

The following diagram is the schematic diagram of gas path connection for SCB-PB series controllers:

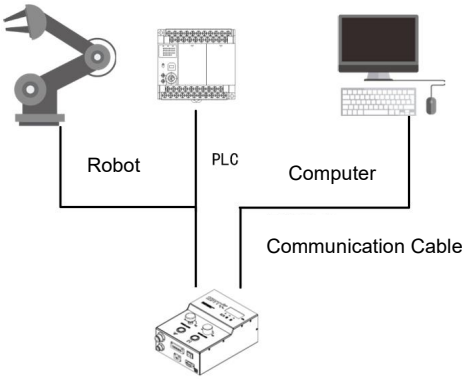


3.3 Line connection

Before the circuit connection, the controller should be within 3 m from the robot or PLC, and the DB9 data line should be installed firmly when debugging or communicating the controller.

When the circuit is connected, ensure that the bus head of the wiring terminal is connected firmly and the lock nut is tightened. After the circuit connection, press the power switch, try to run the controller three to five times, after the normal function can continue to use. Once a functional error occurs, the line is immediately turned off to check whether the connection is correct and can continue to use after troubleshooting.

The following figure is the schematic diagram of circuit connection.:



4. Installation and use of debugging software

Use the DB9 data line to connect the computer to the controller before you open the debugging software to ensure a strong connection.

1、Open the debugging software, select the pneumatic controller series, click the corresponding button, and enter the next interface;

2、Click ' Open the connection ', after the connection is successful, the lower left corner of the software interface prompts : ' Successful connection '. If you cannot connect properly, select the data line corresponding to the COM port connection controller in the ' COM ' right drop-down menu.

3、 ' Real-time pressure ' displays the pressure value at the pressure output port.

' Number of work ' shows the number of working cycles of the controller.

The ' loop cycle ' is the controller ' s loop working cycle, so that the time interval between the two actions is set to 0 ~ 99 s. Each time the loop time is modified, you need to click the right ' application ' button to save.

'Current state ' : The initial state is white. After grabbing or opening, bright green. After detected air leakage, bright red.

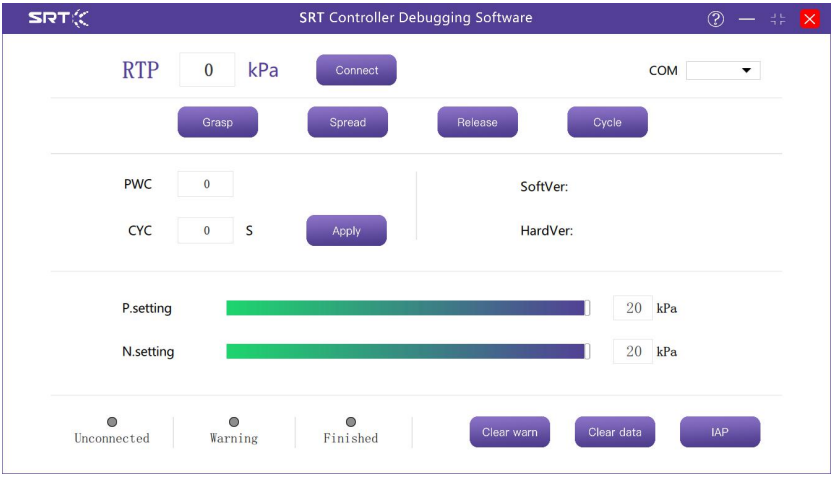
'Positive pressure grasping ', ' negative pressure opening ' and ' pressure releasing ' correspond to grasping, opening and pressure releasing respectively.

The ' Loop Work ' button clicks and the controller works periodically according to the ' Loop Time '.

4、The positive pressure setting value shows the current gear grasping pressure setting value, and the negative pressure setting value shows the current gear opening pressure setting value. PB series controller can only display these two parameters in the software without modification function. PT series can modify the setting parameters in the software.

5、 ' Clearing the alarm state ' is to clear the alarm information of the controller. ' Clearing historical data ' reduces the number of controller operations to zero.

6、The ' IAP ' function is the controller online upgrade function, which is gradually opened later.



5. User information

When the product fails, please contact our sales staff, if necessary, please mail the product to our after-sales service department for maintenance.

1. Unauthorized disassembly of this product may cause problems such as accidental damage. Without permission, the warranty is scrapped when the product is disassembled privately !
2. When this product is discarded, it should be treated according to the industrial waste standard to avoid pollution to the environment.
3. When the product is used in equipment directly related to personal installation (medical equipment, entertainment equipment, industrial machinery and equipment, etc.), attention must be paid to the preparation of auxiliary protective measures to avoid possible personal hazards.
4. Electronic products have corresponding life cycle, when applied to this product, there must be sufficient protection measures. In accidents such as product failure, please ensure personal safety.
5. Customers who install and use this product shall bear their own losses due to mechanical failure or misoperation.

Warranty service

1. The warranty period of this product is free of charge for twelve months from the date of shipment.

2. If malfunctions of the product occur and they are verified to originate from quality problems of the product, free repairing or product replacement will be provided by our company. However, if they originate from misoperation of the user,our company shall not take any responsibility. Losses or accident responsibilities caused by product malfunctions are not covered by this guarantee.

3. In addition, the warranty is not available if product damage or failure are caused by following causes:
   - Malfunctions and damages caused by fire, earthquakes, floods and other force majeures.
   - Misoperations and other operations that disobey the user's manual.
   - Disassembly without permission when product malfunctions.

Note :When you dispose of this product, please dispose of it by industrial waste standards to avoid environmental contamination.

* The right of final interpretation is reserved by our company.

Warranty card

Product name		
Product model		
Purchase date		
Guest name		
Guest phone number		
Guest address		
Maintenance time	Maintenance record	Signature of maintenance staff

* This card is the basic voucher of warranty, please fill in carefully and savethis card properly.

Product certificate

This product is qualified according to the delivery inspection.

Productmodel: _____

Inspector: _____

Manufacturing date: _____

Website

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