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Pneumatic Systems V2
User Manual

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Items included

The pneumatic systems referred to:

- Suction gripper kit
- Soft gripper kit
- Pneumatic gripper kit

Depending on your kit you will get a package of items ready to set up and operate with the robot.

Note

Throughout this document; we use a 4 mm (OD) air tube and 4 mm push-to-connect tube fittings for passing the air and connecting the pneumatic devices. All of our suggestions in this document are based on these dimensions. Notice that you can always use different tube sizes and fittings based on your application.

Suction gripper kit

The items in this kit are:

- Suction cup
- Toolhead adapter and mounting screws
- Vacuum ejector
- Push-to-connect tube fittings
- Solenoid valve
- I/O cable
- Air tube

Soft gripper kit

The items in this kit are:

- Soft gripper
- Toolhead adapter and mounting screws
- Vacuum ejector
- Push-to-connect tube fittings
- Solenoid valve
- I/O cable

- Air tube

Pneumatic gripper kit

The items in this kit are:

- Pneumatic gripper
- Toolhead adapter and mounting screws
- Push-to-connect tube fittings
- Solenoid valve
- I/O cable
- Air tube

Air compressor

To run and operate a pneumatic kit, you need to have access to compressed air. Most generic air compressors in the market can work with our pneumatic kits.
Something you want to keep in mind when searching for an air compressor is

- The noise level
- Air tank volume
- Portability
- Operating voltage

For example, this air compressor can be a good general candidate.

Note

Your kit does not include an air compressor.

Pressure level

The suction force of a suction cup, or the jaw force in a pneumatic gripper, is proportional to the air pressure generated by the air compressor. We usually set the air compressor to `500 kPa` (`72.5 psi`).

> **Note**
>
> Depending on your application; you can always increase or decrease the air pressure. Read your tool head and air compressor datasheet to find the right and safe values.

Air compressor adaptors

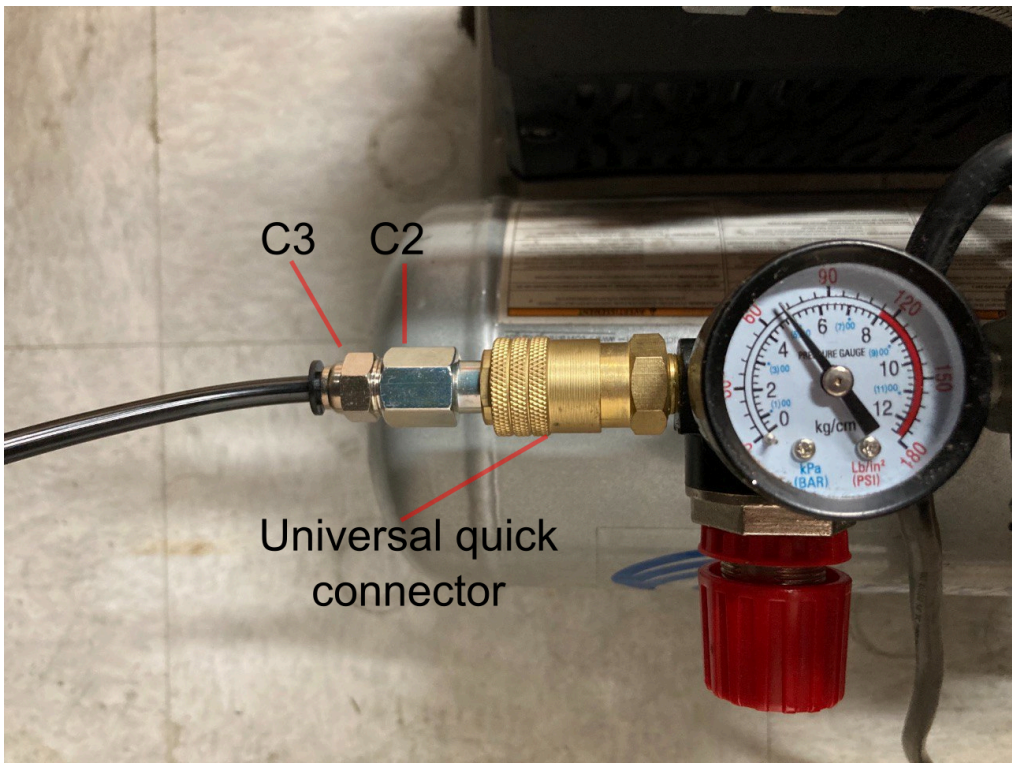

Fig 1. Air compressor air routing.

You usually need the right coupler(s) to connect the `4 mm` air tube to the air compressor. Most air compressors have a universal quick connector to connect to your device. In that case, you need:

- (`C2`) Industrial quick-disconnect hose coupling to attach a push fitting to the air compressor (example).
- (`C3`) Push-to-connect tube fitting to connect the air tube to the air compressor (example).

> **Note**
>
> Items C2 and C3 are not included in your kits, and you need to get them according to your air compressor.

Wiring

In this section, we explain how to wire the pneumatic kit and control it with the robot. The items in this section and their pin assignment are as follows:

> **Warning**
>
> Make sure to connect all the I/O wires when the controller is turned off. Connecting the I/O wire to the controller when the controller is on can damage the robot controller.

Connections

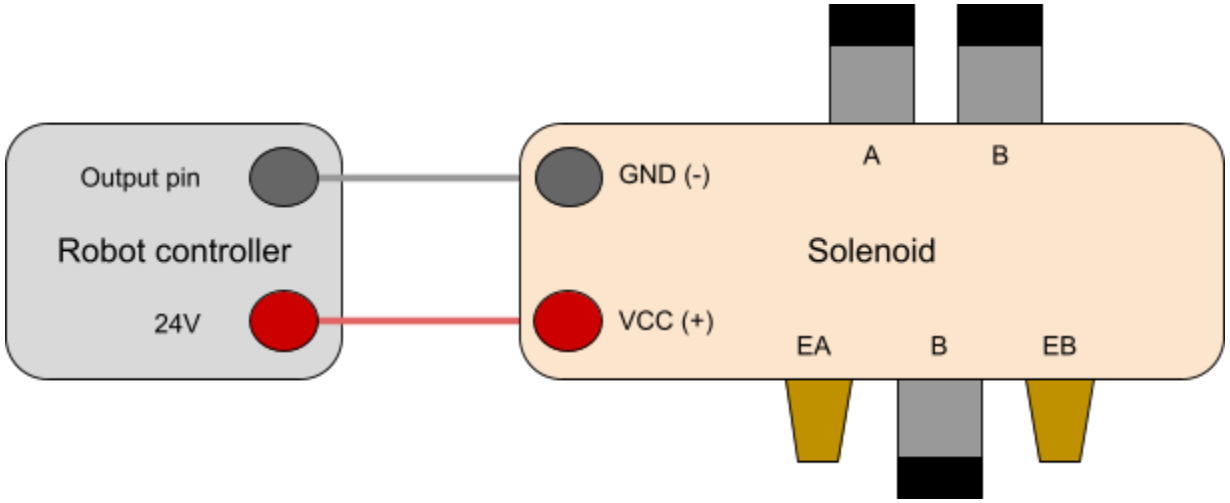

Fig 2. Pneumatic kit wire diagram.

- The VCC pin (red wire) on the solenoid is connected to the 24V pin on the robot controller.
- The GND pin (black pin) on the solenoid is connected to one of the robot controller output pins.

Air connection

Suction gripper kit

This kit operates by negative pressure (suction). To create a suction force (vacuum), we use a device called (Venturi) vacuum ejector. The vacuum ejector has two main ports:

- Port 1 (also known as port P or pressure port): Apply the air pressure to this port.
- Port 2 (also known as port V or vacuum port): Once pressure is applied to port 1 of the ejector, we get a vacuum on port 2 of the ejector.

> **Note**
>
> The Venturi vacuum ejector is not bidirectional, and it is important to apply the air pressure on port 1, to create a vacuum on port 2.

In this setup, you must:

- Block port A on the solenoid.
- Connect port B on the solenoid to port 1 of the vacuum ejector, and connect port 2 of the vacuum ejector to your suction cup.

> **Note**
>
> To reverse the state of the gripper, you can change the role of ports A and B on the solenoid, which means:
>
> - Block port B on the solenoid.
> - Connect port A on the solenoid to port 1 of the vacuum ejector, and connect port 2 of the vacuum ejector to your suction cup.

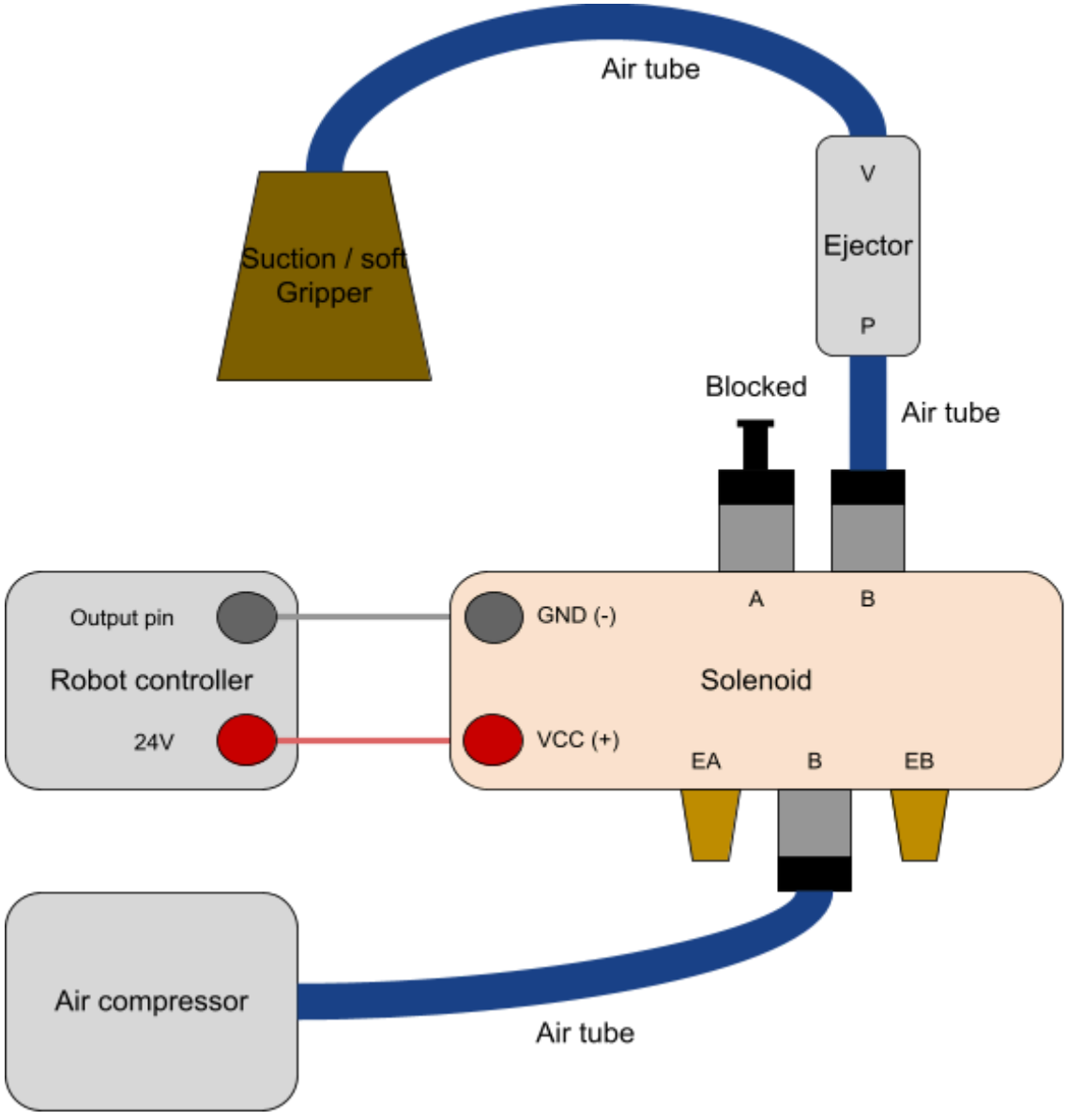

Fig 3. Suction gripper kit air routing.

Soft gripper kit

This kit works exactly similar to the suction gripper kit.

Pneumatic gripper kit

These types of pneumatic tools work with air pressure and not vacuum. They usually have two airports for open and closed states. When applying air pressure on one port, the gripper goes to the all-open state; when applying air pressure to the other port, it goes to the all-close state.
In this setup, we need to:

- Connect port `A` on the solenoid to one of the gripper ports.
- Connect port `B` on the solenoid to the other gripper port.

Note

To reverse the state of the gripper, you can change the role of ports `A` and `B` on the solenoid, or on the gripper side.

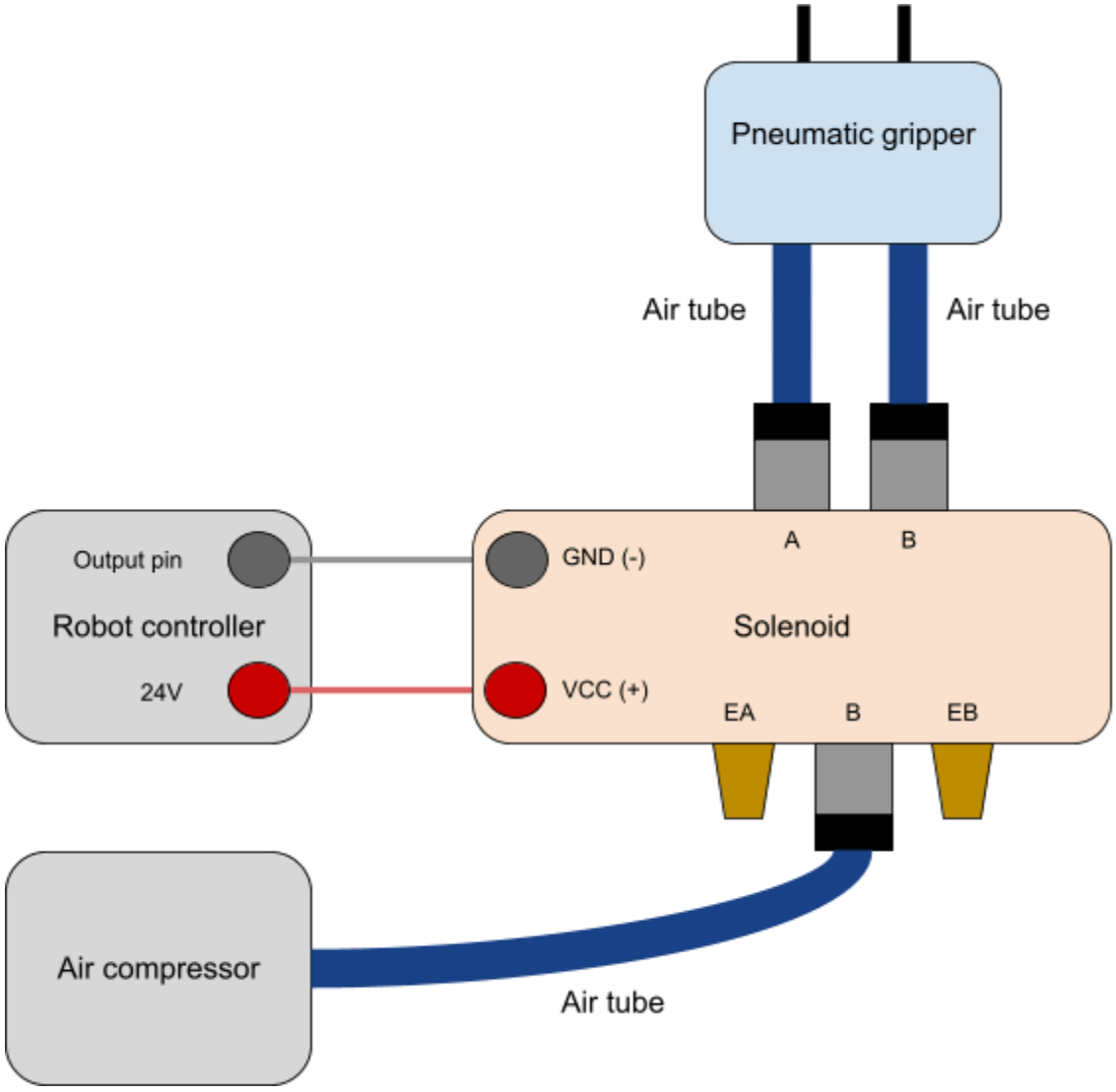

Fig 4. Pneumatic gripper kit air routing.