

Python Quick Start Guide for Windows: **Qube-Servo 3**

STEP 1 Check Components and Details

Make sure your Qube-Servo 3 Platform includes the following components.



1. Quanser Qube-Servo 3
2. Rotary pendulum module
3. Inertial disc module
4. 24V, 2.71A power supply and power cable
5. USB A/C cable
6. Qube-Servo 3 Resources. Technical resources and courseware provided digitally at www.quanser.com/resources

STEP 2 Install and Test QUARC and Quanser's Python Packages

A

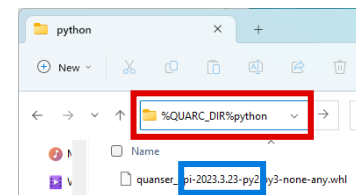
Follow the *QUARC Installation Guide* to download it to your computer and to get further installation and testing instructions.

Python (3.8 or later), pip and the numpy library are required for the next steps.

B

Go to **%QUARC_DIR%python** in file explorer. It will open the python folder inside the QUARC installation.

Take note of the **date** in the whl files. You will use it for your install.



C

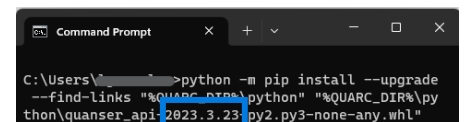
Open a command prompt and update pip

```
python -m pip install --upgrade pip
```

D

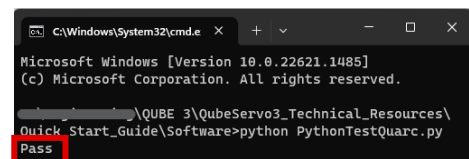
In command prompt, install the Quanser's Python libraries using the **date** from your whl files

```
python -m pip install --upgrade --find-links  
"%QUARC_DIR%\python" "%QUARC_DIR%\python\quanser_api-  
2022.10.4-py2.py3-none-any.whl"
```



E

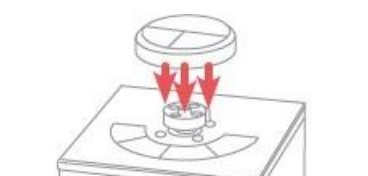
Change directories to the **Technical Resources\Quick Start\Software** folder (downloaded from step 1) and type `python PythonTestQuarc.py`. If the installation succeeded, it should output **Pass**.




STEP 3 Set Up the Hardware

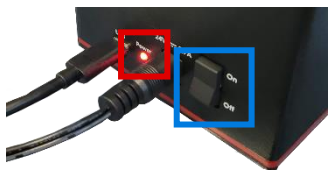
The steps below outline the instructions to setup the Qube-Servo 3.

A Place the Qube-Servo 3 on a flat surface with enough space so that the modules will not be obstructed.

B  Connect the inertia disc module to Qube-Servo 3 base by aligning the inertia disc magnets with the magnets on the Qube-Servo 3 module connector. The module should snap into place.


C  Connect the supplied 24V power supply to the **Power connector** on the Qube-Servo 3 and to a wall outlet using the included power cable.

Connect the **USB C connector** to the Qube-Servo 3 and to a USB port on your desktop PC or laptop.

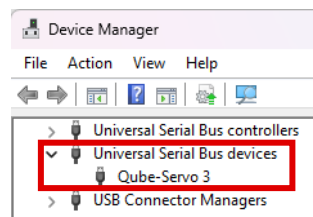
D  Move the **power switch** to the **On** position.

The **Power LED** and the **top LED light strip** on the Qube-Servo 3 should light up red.

E If QUARC was installed properly as described in Step 2, Windows¹ should automatically detect the presence of the Qube-Servo 3.

F  The **Power LED** on the Qube-Servo 3 should change from red to green.

G Go to Windows **Device Manager** and verify that the Qube-Servo 3 item appears under the *Universal Serial Bus devices*.



¹Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

STEP 4

Testing the Qube-Servo 3

Follow the procedure below to test your Qube-Servo 3 experiment.

A

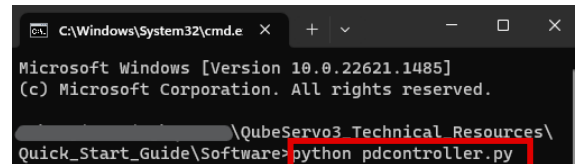
Make sure your PC and the Qube-Servo 3 with the inertia disc are powered ON and connected.

B

1. Download the Qube-Servo 3 **Simulink Technical Resources** and **Simulink Courseware Resources** from www.quanser.com/resources. This will include the Python resources.
2. Extract the **Technical Resources** file to a folder on your local hard drive.

C

Open command prompt in the **Technical Resources\Quick Start\Software** folder, and type `python pdcontroller.py`. It should run a basic PD control on a square wave input to the Qube-Servo 3.

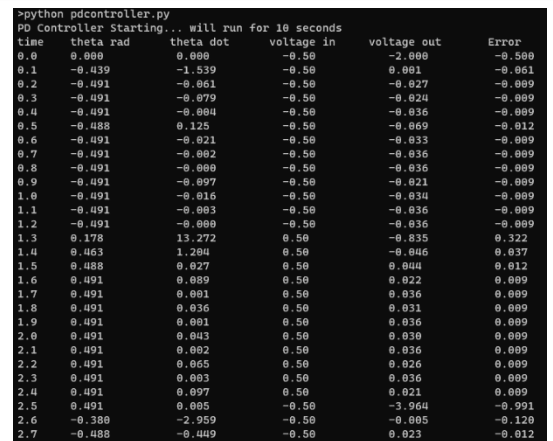


```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.22621.1485]
(c) Microsoft Corporation. All rights reserved.

C:\QubeServo3_Technical_Resources\
Quick_Start_Guide\Software>python pdcontroller.py
```

D

1. The output prints results every 0.1 seconds and it will run for 10 seconds.
2. The results should look like the ones in the image. It is a Python equivalent of the Simulink test file.
3. This example is only using the motor encoder output. However, the Python file does all the available reads to be used as reference.



```
>python pdcontroller.py
PD controller Starting... will run for 10 seconds
```

time	theta rad	theta dot	voltage in	voltage out	Error
0.0	0.000	0.000	-0.50	-2.000	-0.500
0.1	-0.439	-1.539	-0.50	0.001	-0.061
0.2	-0.491	-0.061	-0.50	-0.027	-0.009
0.3	-0.491	-0.079	-0.50	-0.024	-0.009
0.4	-0.491	-0.004	-0.50	-0.036	-0.009
0.5	-0.488	0.125	-0.50	-0.069	-0.012
0.6	-0.491	-0.021	-0.50	-0.033	-0.009
0.7	-0.491	-0.002	-0.50	-0.036	-0.009
0.8	-0.491	-0.000	-0.50	-0.036	-0.009
0.9	-0.491	-0.097	-0.50	-0.021	-0.009
1.0	-0.491	-0.016	-0.50	-0.034	-0.009
1.1	-0.491	-0.003	-0.50	-0.036	-0.009
1.2	-0.491	-0.000	-0.50	-0.036	-0.009
1.3	0.178	13.272	0.50	-0.035	0.322
1.4	0.483	1.204	0.50	-0.006	0.037
1.5	0.488	0.027	0.50	-0.004	0.012
1.6	0.491	0.009	0.50	-0.022	0.009
1.7	0.491	0.001	0.50	-0.036	0.009
1.8	0.491	0.036	0.50	-0.031	0.009
1.9	0.491	0.001	0.50	-0.036	0.009
2.0	0.491	0.043	0.50	-0.030	0.009
2.1	0.491	0.002	0.50	-0.036	0.009
2.2	0.491	0.005	0.50	-0.026	0.009
2.3	0.491	0.003	0.50	-0.036	0.009
2.4	0.491	0.097	0.50	-0.021	0.009
2.5	0.491	0.005	-0.50	-3.964	-0.991
2.6	-0.300	-2.959	-0.50	-0.005	-0.120
2.7	-0.488	-0.449	-0.50	-0.023	-0.012

E

If you stopped the file before it finished running (with CTRL-C), it should properly close the HIL device and you should be able to start it again. If you are unable to start it, turn the Qube off and on again using the switch in the back and try to run it again.

TROUBLESHOOTING

Review the following recommendations before contacting Quanser's technical support engineers.

Confirm connections and switch position from Step 3 of this guide to connect and turn on the Qube.

You see 'An operating system specific kernel-level driver for the specified card could not be found' message.

- A. Make sure the Qube-Servo 3 is connected to your PC/Laptop with the supplied USB cable to an enabled USB port.
- B. Ensure the *Power* LED on the Qube-Servo 3 is lit green. If not, confirm that the switch in the back of the Qube Servo is set to the ON position and the power supply is operational (i.e., LED is lit) and properly connected.

The motor is not responding.

Ensure the *Power* LED on the Qube-Servo 3 is lit green. If not, make sure the power supply is operational and properly connected.

LEARN MORE

To browse and download the latest Quanser resources visit www.quanser.com/courseware

STILL NEED HELP

For further assistance from a Quanser engineer, contact us at tech@quanser.com

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