Qiagen QIAcube Connect Maintenance

1. Purpose

This document explains the maintenance procedures for the Qiagen QIAcube Connect (QIAcube) instrument.

2. Summary

Post-Run, Daily, Weekly, Monthly, and periotic maintenance is required for the QIAcube instrument.

3. Procedure

Define the procedures in bulleted format.

Maintenance:

Post Run Maintenance

1. Open the waste drawer and empty tips and columns (if necessary) into a suitable laboratory waste container.
2. Remove used disposable labware and unwanted samples and reagents from the worktable. Discard them according to your local safety regulations.

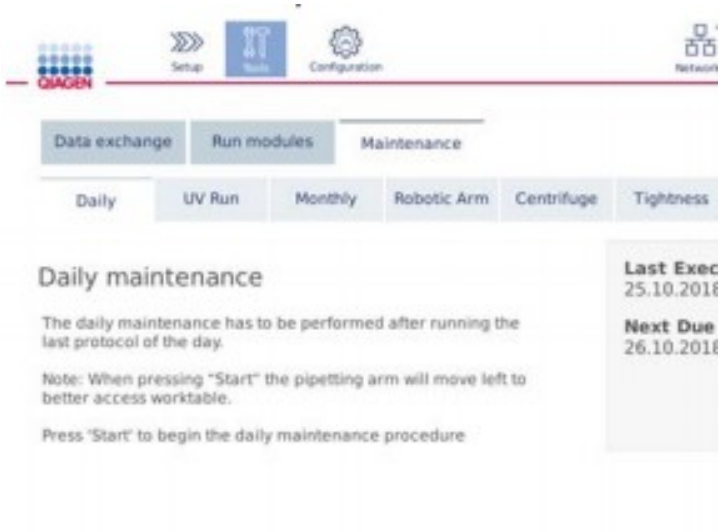
   Note: If the robotic arm prevents you from reaching a position, do not move the robotic arm manually. Instead, proceed as follows:

   a. Press **Move left** or **Move right**, as needed. The robotic arm will start to move. The hood can remain open during this movement. Ensure that you stand clear of the instrument while the robotic arm is moving. Wait until the robotic arm has completed its movements.
3. Replace the lids of the reagent bottles and close tightly. Store the bottles according to the instructions in the relevant kit handbook. You can now run another protocol or switch off the QIAcube Connect.

Daily Maintenance

After running the last protocol of the day, perform the daily maintenance procedure:

4. Press the **Tools** icon. 
5. Press the **Daily** subtab under the **Maintenance** tab. The screen shows the **Last Executed** and the **Next Due** daily maintenance dates.



6. Press **Start**. Follow the instructions on the screen. Details are provided in the next steps below. The robotic arm will automatically move slowly to the left – even if the instrument hood is open – to provide access to the loading positions. Always stand clear of the instrument while the robotic arm is moving. Wait until the robotic arm has completed its movements before you start to unload.

7. Remove used disposable labware, adapters and unwanted samples and reagents from the worktable. If required, discard them according to your local safety regulations.

8. Close the buffer bottles tightly and store according to the instructions in the relevant kit handbook.

9. Press **Done** to confirm that the steps have been completed.

10. Empty the waste drawer and check that the inlay is clean. If necessary, clean the inlay of the waste drawer with alcohol-based disinfection wipes, or by soaking using one of the cleaning agents listed above, and then rinse with distilled water.

11. Wipe and clean the worktable with alcohol-based disinfection wipes. Incubate as appropriate, rinse thoroughly with distilled water and wipe dry with paper towels.

    Note: Do not use alcohol or alcohol-based disinfectants to clean the hood.

12. Press **Done** only when the steps listed above have been successfully completed. The date of the last performed daily maintenance is updated automatically. The robotic arm will automatically move back to its original position (above tip rack position 3).

UV Decontamination
UV decontamination must be performed daily. It helps to reduce possible pathogen or nucleic acid contamination of the QIAcube Connect worktables. The efficiency of inactivation is to be determined for each specific organism and depends, for example, on layer thickness and sample type. QIAGEN cannot guarantee complete eradication of specific pathogens. During UV decontamination, the robotic arm will move slowly across the worktable. The default cycle number is 1 (approximately 12 minutes) for maintenance. In case you visually see splashes on the worktable, you must increase the cycle number based on used sample material/pathogens.

Note: Before starting the UV irradiation procedure, ensure that daily maintenance is performed and thereby all samples, eluates, reagents and disposable labware are removed from the worktable. During each cycle, an average summed dose rate of 28 to 46 mW*s/cm2 can be achieved by UV LED light.

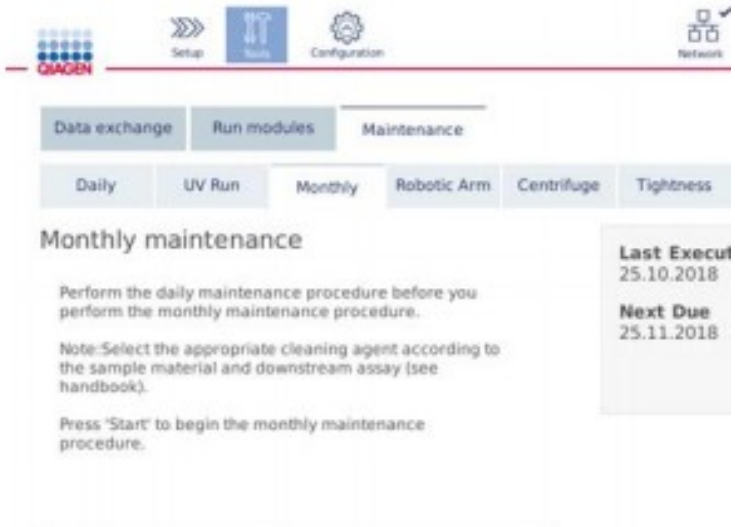
13. Press the **Tools** icon and press the **UV run** subtab under the **Maintenance** tab. The screen shows the Last Executed UV run date and the Cycle duration.

14. In the Cycle field, change the number of cycles. The default cycle number is 1 (approximately 12 minutes).
15. Ensure that all disposable labware has been removed from the worktable.

    Important: Ensure that the waste drawer is closed. Do not open it during the UV run.
16. Close the hood and press **Start** to begin the UV run.
17. Press **Done** once the UV run is completed. The date of the last performed UV-run is updated automatically.

Monthly Maintenance
Perform the regular maintenance procedure before you perform the monthly maintenance procedure. Select the appropriate cleaning agent according to the sample material and downstream assay (see Section 6).

18. Press the Tools icon. 
19. Then press the Monthly subtab under the Maintenance tab. The screen shows the Last Executed and the Next Due monthly maintenance dates.



20. Close the hood.
21. Press **Start**. Follow the instructions on the screen. Details are provided in the next steps below. The robotic arm will move to the cleaning position.
22. Thoroughly clean the worktable with alcohol-based disinfection wipes. Incubate as appropriate, rinse thoroughly with distilled water and wipe dry with paper towels.

    Important: Do not use alcohol or alcohol-based disinfectants to decontaminate the QIAcube Connect hood.
23. Clean the touchscreen with alcohol-based disinfection wipes and wipe dry afterwards.

    Important: Take care that no liquid runs down the touchscreen. Liquid may be drawn through the dust protection sealing by capillary forces and cause malfunction of the display. To clean the touchscreen, moisten a soft lint-free cloth with ethanol or a mild disinfectant and carefully wipe the display. Wipe dry with a paper towel.
24. Clean the outer hood with a soft lint-free cloth moistened with water or mild detergent.

25. Clean the shaker adapter (grey), shaker tray (metal adapter), buffer bottle rack (and waste drawer in liner if not done during daily maintenance) with alcohol-based disinfection wipes.

26. Incubate the shaker adapter (grey), shaker tray (metal adapter), buffer bottle rack and waste drawer in liner by soaking as appropriate. Rinse thoroughly with distilled water and wipe dry with paper towels.

27. Press **Done** only when the steps listed above have been successfully completed. The date of the last performed monthly maintenance is updated automatically.

    Important: Inspect the waste drawer during maintenance. Contact QIAGEN Technical Services if any broken parts are observed.

28. Transfer the run reports from the instrument to the USB stick and remove the run reports from the instrument. Only the last 200 run reports are saved on the instrument. For details refer to section 5.7 Saving run reports.

Periodic Maintenance
Cleaning the robotic arm modules Cleaning of the robotic arm modules must be performed periodically or could be performed if required. For example, the robotic arm modules must be cleaned if liquids were spilled due to crash.

Note: Perform the monthly maintenance procedure before you perform the robotic arm cleaning procedure.

29. Press the **Tools** icon and press the Robotic Arm subtab under the **Maintenance** tab. The screen shows the **Last Executed** maintenance date of the robotic arm modules.

30. Press **Start** to begin the cleaning of robotic arm modules. Follow the instructions on the screen.

31. Make sure that used Labware, adapters and reagents are removed from the worktable. Close the hood.

32. Press **Next** to move to cleaning position.

33. Remove the waste drawer and open hood.

34. Open the waster drawer. Moisten a soft lint-free cloth with water and carefully clean the optical sensor, tip adapter, gripper unit, rotor adapter stabilization rod and the spin column lid holder. Wipe these items dry as indicated on the touchscreen of the instrument.

35. Close the hood and press **Done** to finish cleaning of robotic arm. The date of the last performed cleaning of robotic arm is updated automatically.

Cleaning the Centrifuge
Cleaning of the centrifuge arm must be performed periodically or could be performed if required. For example, the centrifuge must be cleaned in case of plastic crash or spillage of liquids due to crash.

WARNING Risk of personal injury and material damage [W5] To prevent plastic crash, load the tubes properly. After a plastic crash, sharp plastic particles could be inside the centrifuge. Be careful when handling items inside the centrifuge.

Note: Perform the monthly maintenance procedure before you perform the cleaning of centrifuge procedure.

36. To start cleaning the centrifuge, press the **Tools** icon and press the **Centrifuge** subtab under the **Maintenance** tab. The screen shows the Last Executed centrifuge maintenance date.

37. Press **Start** to begin the centrifuge cleaning procedure. Follow the instructions on the screen.

38. The centrifuge lid must be open to allow access to the inside of the centrifuge. The lid should be opened only after the centrifuge has come to a complete stop. If the lid does not open automatically, close the hood and press the **Open Centrifuge Lid** button.

39. Perform cleaning as outlined in the following sections (below): Cleaning the rotor and buckets, Cleaning the centrifuge, Maintenance of the rotor nut, and Installing the centrifuge rotor and buckets.

40. Turn on the instrument. Press the **Tools** icon and press the **Centrifuge** subtab under the **Maintenance** tab.

41. When cleaning is completed, press **Start** again then press **Done** to confirm cleaning. The date of the last performed cleaning of centrifuge is updated automatically.

Cleaning the Rotor and Buckets

42. Switch off the QIAcube Connect.

43. Remove all disposable rotor adapters, including tubes and spin columns, from the buckets.

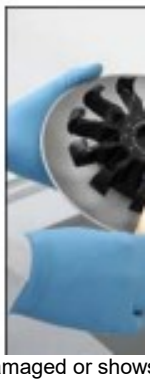
44. Remove the buckets from the rotor. Undo the rotor nut on top of the rotor using the rotor key, and carefully lift the rotor off the rotor shaft.

45. Submerge the rotor, buckets and rotor nut in cleaning agent. Incubate as appropriate.

46. Rinse thoroughly with distilled water. Use a brush (e.g., a toothbrush or tube brush) to clean any parts that are difficult to access, such as the bucket mount and the rotor head. Wipe surfaces dry with a soft lint-free cloth. If available, dry the buckets and rotor with pressurized air. Brushing a bucket Brushing the rotor

    Important: Make sure the paper towels and brush used are lint-free.

Important: Make sure that all residual salt is removed.
Important: Make sure to remove all traces of cleaning agent from the centrifuge buckets. Residual agent can cause the buckets to jam.

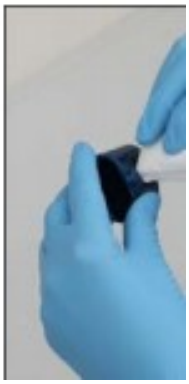


47. Carefully check the rotor for damage. If the rotor is damaged or shows signs of wear or corrosion, do not use the rotor. Contact QIAGEN Technical Services.

48. Apply a few drops of mineral oil on a soft, lint-free cloth, and wipe the bucket mount and rotor claw. A thin, invisible oil film should cover the bucket mount and rotor claw, but no droplets or smear should be apparent.

49. Apply oil to the rotor claw and to the bucket mount.

    Important: Before applying oil to the rotor buckets on the rotor, make sure that the rotor and all buckets are completely dry.



Cleaning the Centrifuge

50. Moisten a soft lint-free cloth with cleaning agent and clean the inside of the centrifuge and the centrifuge gasket. Incubate as appropriate.

51. Clean the inside of the centrifuge and the gasket with distilled water and wipe dry with lintfree paper towels. If available, use a vacuum cleaner.

    Important: Make sure the gaskets remain in the proper positions.

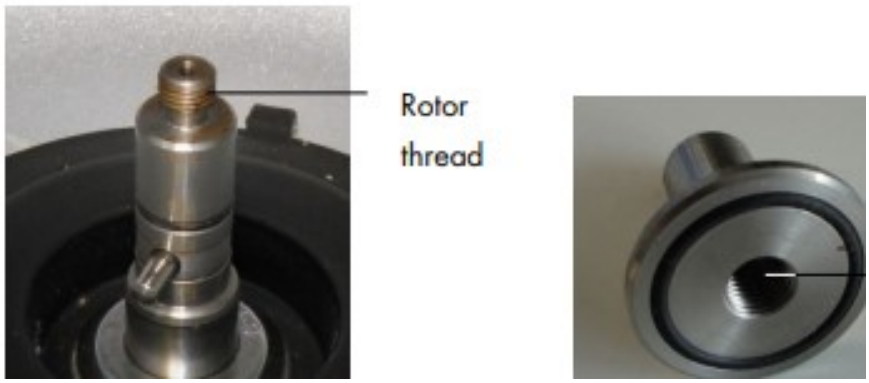
52. Clean the centrifuge lid with a soft lint-free cloth moistened with cleaning agent. Incubate as appropriate, clean with water and wipe dry with paper towels.

53. Check the centrifuge gasket for damage. If the gasket is damaged or shows signs of wear, contact QIAGEN Technical Services.

Maintenance of the Rotor Nut

Note: Always perform the cleaning procedure after disassembly of the rotor and at least twice a year.

After cleaning the rotor thread, apply a few drops of mineral oil (Anti-Corrosion Oil (rotor), cat. no. 9018543) on a lint-free cloth and wipe the thread. A thin, invisible oil film should cover the rotor thread but no droplets or smear should appear.



Installing the Centrifuge Rotor and Buckets

54. Mount the rotor.

55. The rotor can be mounted in only one orientation. The pin on the rotor shaft fits into a notch on the underside of the rotor directly underneath rotor position 1. Line up position 1 of the rotor with the pin on the rotor shaft and carefully lower the rotor onto the shaft.

56. Install the rotor nut on top of the rotor and tighten securely using the rotor key supplied with the QIAcube Connect. Make sure that the rotor is securely seated.

Important: If the rotor nut is not tightened properly, it can become loose during operation of the centrifuge and can cause serious damage to the instrument.

57. Replace the rotor buckets.

    When replacing the rotor buckets, the side of the rotor bucket that must face toward the rotor shaft is marked with a grey line. Hold the bucket at an angle with the grey line facing the center of the rotor and hang the bucket on the rotor. Check that all buckets are properly suspended and can swing freely.

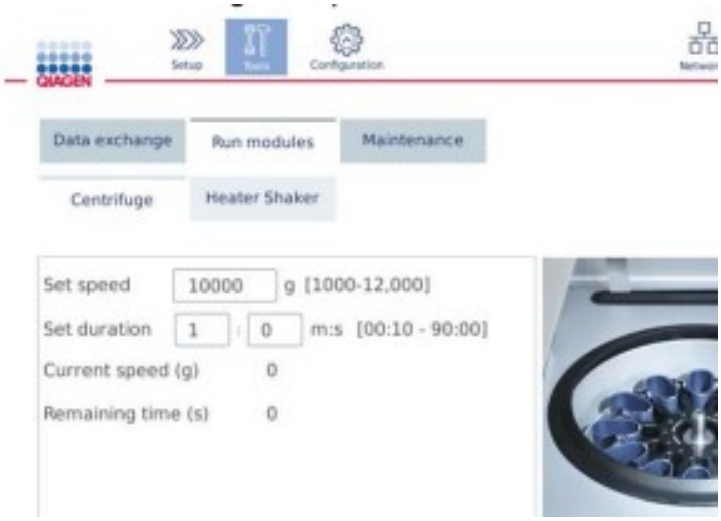
    Important: All centrifuge buckets must be mounted before starting a run. Before starting next protocol run, follow the instructions in the next section.

Operating the Centrifuge After Cleaning

The centrifuge must be operated independently before starting further runs to check if residual plastic parts are still in the centrifuge.

Note: Rotor adapters and other consumables are not required.

58. Press the **Tools** icon and then the **Run Modules** tab.



59. In the **Set speed** and **Set duration** fields, set the speed to 10,000 g and the duration to 1 min (1:0 m:s), respectively.

60. Press **Start** to begin the centrifuge run.

61. Carefully listen to the sound during centrifugation.

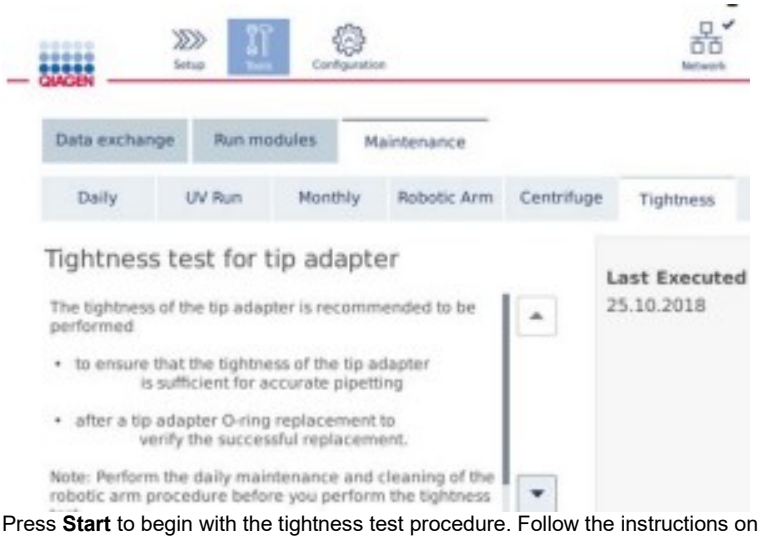
    a. If any grinding, rattling or crunching sounds are heard during the centrifugation, there are still loose plastic particles inside the centrifuge. Repeat the cleaning procedure until there are no unusual sounds.
    b. If no unusual sound from loose plastic particles can be heard during centrifugation, the next protocol run can be started.

Tightness Test

To ensure that the tightness of the tip adapter is sufficient for accurate pipetting, the tightness test of the tip adapter must be performed. This test must also be performed after replacing a tip adapter O-Ring to verify if replacement is successful.

Note: Perform the daily maintenance and cleaning of the robotic arm procedure before you perform the tightness test.

62. To start the tightness test, press the **Tools** icon and press the **Tightness** subtab under the **Maintenance** tab. The screen shows the Last Executed tightness test date.



63. Press **Start** to begin with the tightness test procedure. Follow the instructions on the screen.
64. Open the hood and load a 1000 µl tip rack with at least one 1000 µl tip into tip rack position 1.
65. Place an empty 2 ml safe-lock microcentrifuge tube (cat. no. 990381) in position 1 of the shaker (shaker type 2).
66. Place a buffer bottle filled with ≥10 ml 96–100% ethanol in position 1.
67. Close the hood and press **Next** to start tightness test. After the load check, the robotic arm will pick up a tip, aspirate ethanol and move to the tube. The tip will remain in place above the tube for 2 minutes. The tip will be discarded into the waste afterwards.
68. Wait until the test has been completed and then press **Next**.
69. After the protocol is completed, open the QIAcube Connect hood and remove the buffer bottle and tips to store them accordingly.
70. Remove the tube and visually check if liquid is present: If no liquid is present, press **Yes** to record that the test passed. If liquid is present, press **No** to record that the test failed.
71. In case the test failed, repeat the test. If test fails again, it is recommended to replace the O-Ring first (using the O-Ring tab) or contact QIAGEN Technical Services.
72. Press **Done** to finalize tightness test procedure. The date of the last performed tightness test is updated automatically.

O-Ring Exchange

O-Ring replacement must be performed if the tightness test failed or if the following issues are observed:

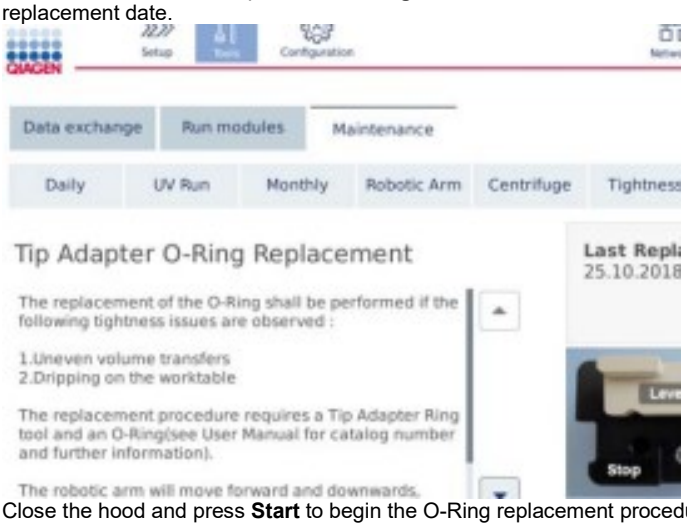
- λ Uneven volume transfers
- λ Dripping on the worktable

The replacement procedure requires the O-Ring change tool and an O-Ring.

The O-Ring replacement is semi-automatically and includes movement of robotic arm.

Note: Perform the daily maintenance and cleaning of the robotic arm procedure before you replace the O-Ring.

73. Press the **Tools** icon and press the **O-Ring** subtab under the **Maintenance** tab. The screen shows the last O-Ring replacement date.



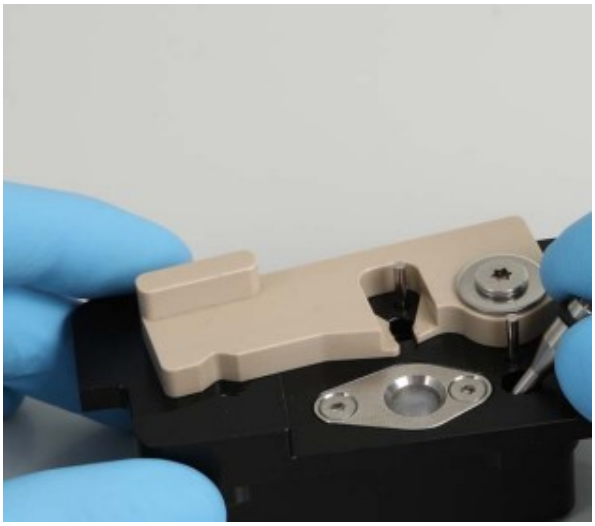
74. Close the hood and press **Start** to begin the O-Ring replacement procedure. Follow the instructions on the screen. Details are provided in the next steps below.

75. To prepare the O-Ring tool, perform the following steps:

    a. Slide the new O-Ring over the small end of the peg.

b. Push the grey lever until you reach the black stop and insert the small end of the peg into the hole.
c. Press the peg down using the back end of the tweezers until the O-Ring sits (in the middle) on the larger end of the peg.

d. Open the grey lever and insert the peg with small end first into hole as shown.

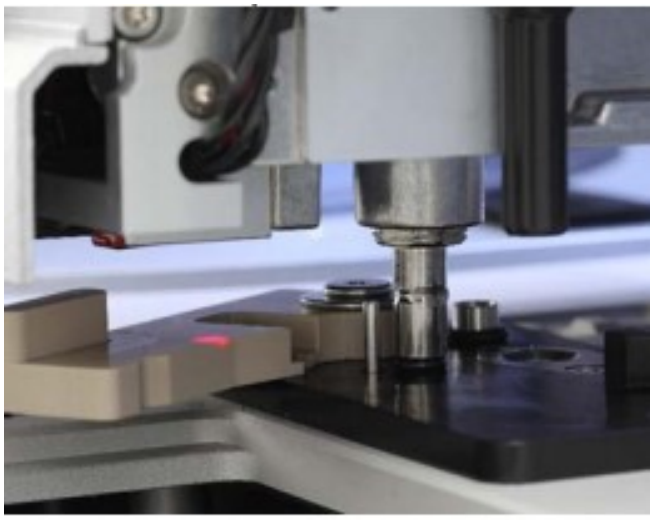


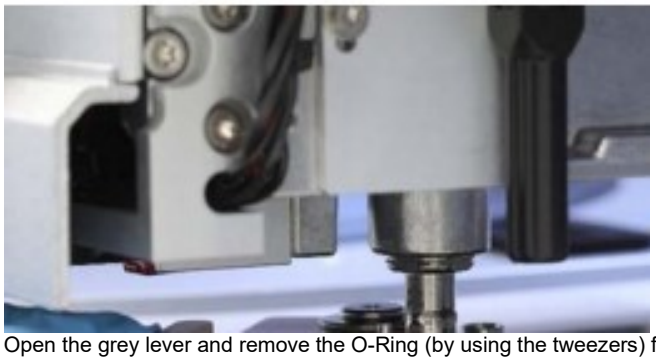
76. Press **Next** to begin loading of the O-Ring tool into the QIAcube Connect.

77. Load the O-Ring tool by opening the grey lever into tip rack position 1 (nearest to user).

78. Close the hood and press Next to begin cutting of the O-Ring.

79. To cut and remove the O-Ring, perform the following steps:
    e. To cut the O-Ring, open the hood and rotate the grey lever counter-clockwise until you reach the black stop.

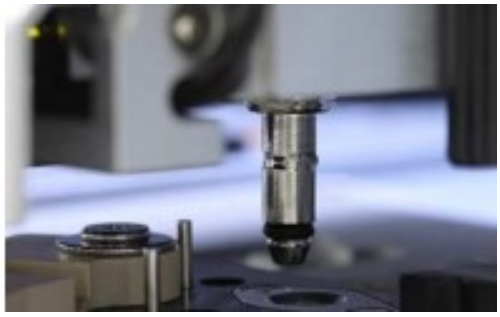




f. Open the grey lever and remove the O-Ring (by using the tweezers) from pipetting channel. Note: If required, repeat cutting process until O-Ring is cut completely and can be removed.

80. Close the hood and press Next to pick up the prepared new O-Ring.

81. Open the hood and visually check if new O-Ring sits firmly on tip adapter.



Note: If the O-Ring was not successfully picked up, complete the O-Ring replacement procedure and restart.

82. Close the hood press **Next** to remove the O-Ring change tool.
83. Open the hood and remove the O-Ring change tool.
84. Wipe and clean the O-Ring change tool with alcohol-based disinfection wipes. Incubate as appropriate, rinse thoroughly with distilled water and wipe dry with paper towels.
85. Press **Done** to complete the O-Ring replacement. The date of the last performed O-Ring replacement is updated automatically.

4. References

QIAcube® Connect User Manual

5. Definitions

N/A