

# Phosphate Analyser Prototype

## Documentation

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## 1. Overview

### 1.1 Description

The Phosphate Analyser is a portable ion chromatography (IC) analyser which can determine the concentration of phosphate in both fresh water and wastewater. Detection of phosphate levels is achieved by indirect UV-vis ion chromatography.

### 1.2 Physical Characteristics

Dimensions	210 x 330 x 560 mm (d x w x h)
Mass	~18 kg
Orientation	Unit must always be kept vertical
IP Rating	IP32

### 1.3 Analysis Details

Detection	Concentration of Phosphate
Cycle length	~18 minutes
Frequency	The time between analysis cycles can be defined by the user.
Eluent	Solution of 0.6 mM potassium phthalate and 60 mM sodium bicarbonate



Figure 1: Analyser case

1.4 Main Components

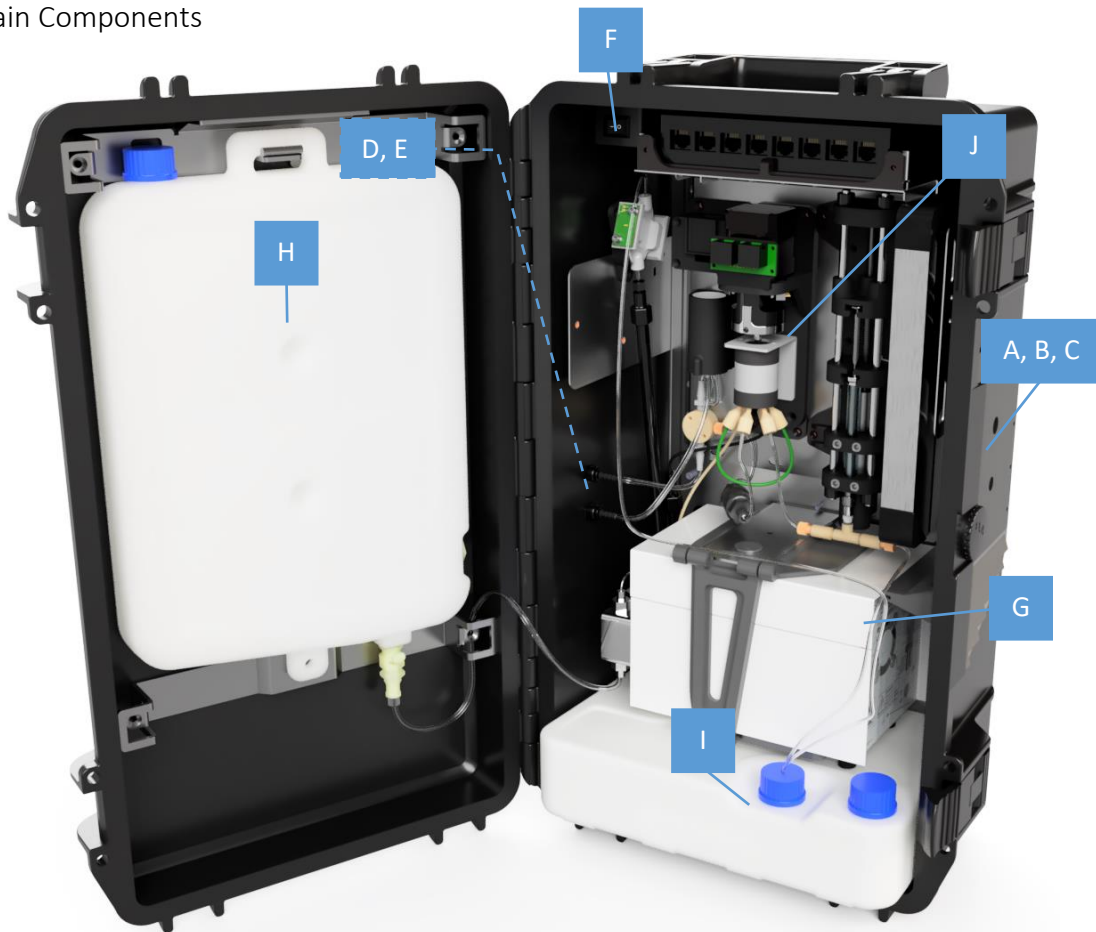


Figure 2: Render of phosphate analyser with main components labelled.

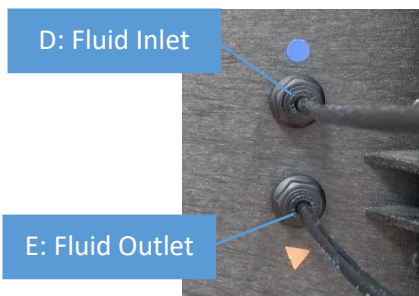


Figure 3a: Close-up of sample fluid connectors

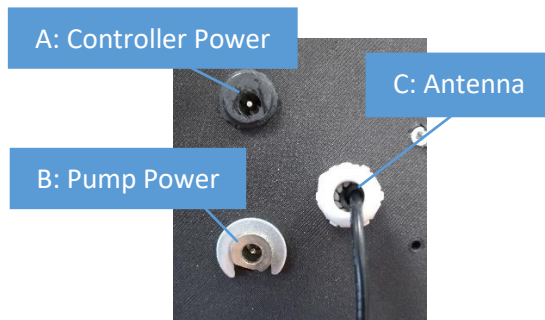


Figure 3b: Close-up of electrical connections

A	Control board power port
B	Piston pump power port
C	IoT module antenna connector
D	Sample fluid inlet pipe
E	Sample fluid outlet pipe
F	Power on/off switch
G	Piston pump
H	Eluent container
I	Waste container
J	Fluidics system

## 2. Operation Procedure

- a. Pre-run checklist
  - i. Ensure that the eluent container has been filled with the supplied potassium phthalate eluent.
  - ii. Ensure that the waste container is empty; it can be disposed in the sewage system.
  - iii. Connect the power cable to the external power supply or battery. Double check that the polarity of the power connection is correct.
- b. Running the analyser
  - i. Turn on the system using the internal on/off switch.
  - ii. The system will immediately begin an analysis cycle after being switched on. All subsequent analysis cycles will complete at the sampling frequency specified on the SD card.
  - iii. Once each run has completed, the resulting data is saved on the SD card and sent to the cloud via a cellular-based IoT module.
  - iv. Approximately 250 runs can be completed by the analyser before the eluent container needs to be refilled and the waste container emptied.
- c. Turning off the analyser
  - i. The system can be turned off using the internal on/off switch.
  - ii. Note: if an analytical cycle is currently in progress, wait until the run has completed and the piston pump has stopped pumping before turning the system off.



Figure 4: Pressing the switch to turn the analyser on and off.

## 2.1 Refilling the Eluent Container

- a. On the bottom quick-release fluid connector, press on the metal tab and pull down on the connector to remove it from the container.
- b. Remove the bolt holding down the bottom of the eluent container.
- c. Lift the container from the mounting brackets, remove the blue lid, and refill the eluent using the provided potassium phthalate and sodium bicarbonate solution.
- d. Close the lid tightly, return the container onto the mounting bracket and reattach the bottom fluid connector and the bottom retaining bolt.



Step (a): Remove quick-release connector



Step (b): Remove the bolt



Step (c): Refill eluent using a funnel

Figure 5: Images showing how to refill the eluent container.

## 2.2 Emptying the Waste Container

- a. Unscrew the two blue lids from the waste container.
- b. While lifting the Knauer pump up slightly, pull the waste container forwards to slide it out.
- c. Empty the waste into the drain while running the water tap.
- d. Place container back into the case and close both lids tightly.

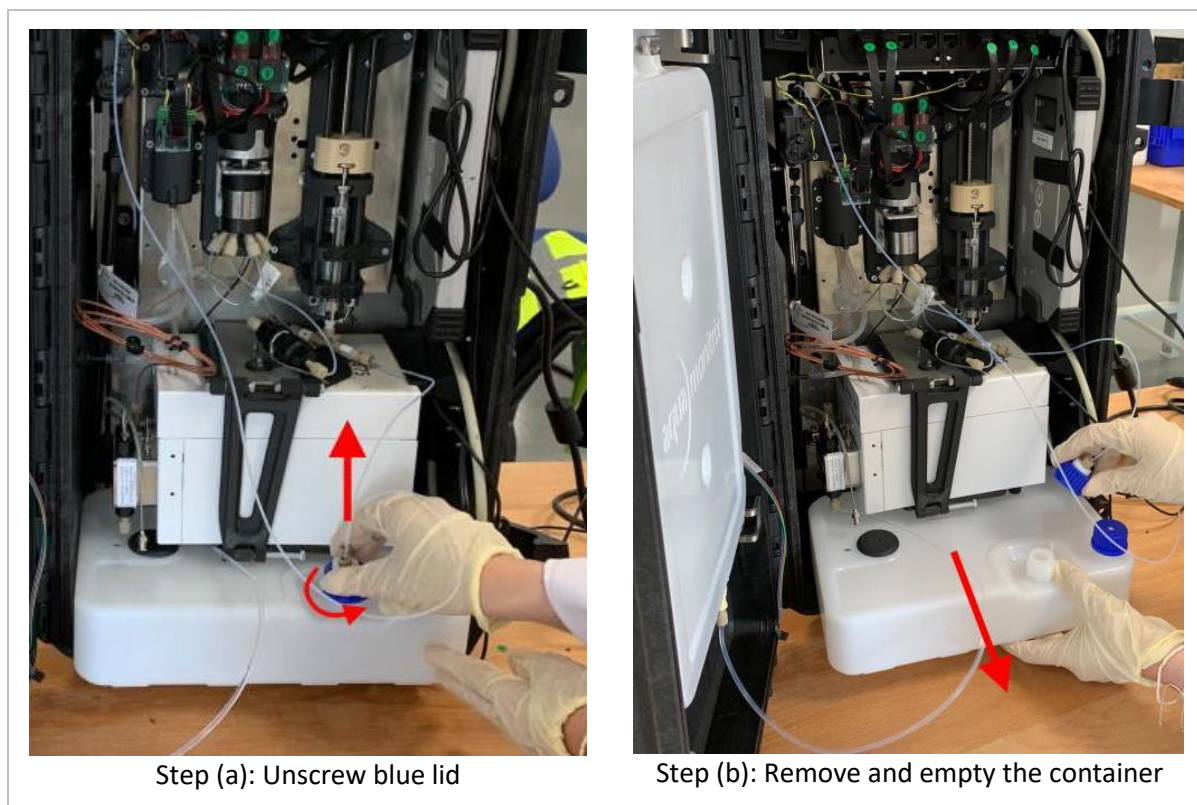


Figure 6: Images showing how to empty the waste container.

### 3. Electronic Specifications

#### 3.1 Connector Cable

Wire	Type	Specifications
1	Control board voltage input	18 V, 2.8 A
2	Ground	
3	Piston pump voltage input	24 V, 2.86 A
4	Ground	

Both power connectors consist of a 5.5mm DC barrel jack (2.1mm inner diameter) and have positive polarity in the centre pin, negative polarity around the outside.

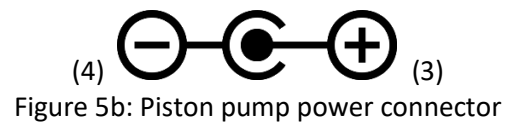
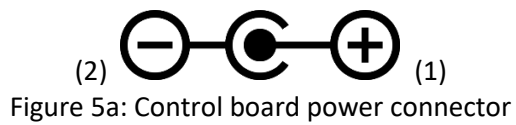


Figure 8: Power connector ports on the analyser IO panel.