Dust Sampler

User Manual

Version 2019-1

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Scope

The manual is a quick guide to get acquainted with Qosain Scientific Dust Sampler. Qosain Dust Sampler is meant for monitoring the Total Suspended Particles (TSP) in ambient air conditions. Qosain Dust Sampler is equipped with PM2.5 and PM10 filters. This manual aims to cover general instructions, safety precautions, quick start guides, and hardware and software installation details for the system.

Contents

1 Before You Start

1.1 Safety Requirements

For the safety of users and to avoid any damage to the equipment, please read the safety protocol carefully before operating the device since the device deals with high voltage and temperature, any negligence while operation can cause damage to the user, instrument, or any other device connected to it.

1. **Use proper power cord with earth.** Only the exclusive power cord with three pins should be used for the instrument. A properly earthed wire connected to the device prevents electric shocks.
2. **Observe all terminal ratings.** To avoid fire or shock hazard, be aware of all ratings and markers on the instrument. Read the manual carefully for more information about ratings before connecting the instrument.
3. **Do not touch during operation.** Since the device operates with a powerful suction motor, avoid touching the system during operation to prevent any accident.
4. **Do not cover the suction head of the system.** Covering the suction head of the system might affect the performance and efficiency of the system and might cause inevitable accidents. So, it is recommended to clean and adequately inspect the suction head before the operation.
5. **Turn voltage knobs to minimum before starting.** Before connecting the power supply to the system, make sure all the voltage knobs have been lowered to the minimum.
6. **Do not operate without covers.** Before operating the device, make sure that the front panel/door for the operation unit is appropriately closed. If the cover of the control unit has been removed for any purpose, secure it back correctly before turning the device on.
7. **Avoid circuit or wire exposure.** Do not touch exposed junctions and components when the unit is powered on.
8. **Do not operate with suspected failures.** If a person suspects that any damage might have occurred to the instrument, have it inspected by Qosain authorized personnel before proceeding to use. In case any

maintenance, adjustment, or replacement is required, either to the software or hardware of the product, it must be carried out by Qosain authorized personnel.

9. **Ensure proper space for operation of device.** Make sure space, where the device is being operated, is enough for the safe operation of the system. Also, inspect the air outlet and the fan regularly.
10. **Do not operate in wet conditions.** To avoid any chances of short circuit inside the instrument or electric shock, never operate the instrument in a humid environment.
11. **Keep Instrument Surfaces Clean and Dry.** For optimal performance of the device, keep its surface free of dust and moisture.
12. **Prevent electrostatic impact.** Operate the instrument in an electrostatic discharge protective environment to avoid damage induced by static discharges. Always ground both the internal and external conductors of cables to release static before making connections.
13. **Use proper over-voltage protection.** Make sure that no over-voltage (such as that caused by a bolt of lightning) can reach the device. Otherwise, the device will be exposed to the danger of an electric shock.
14. **Handle with caution.** Please handle with care during transportation to avoid damage to the front panel, knobs, interfaces, and other parts on the unit.

1.2 Safety Notices and Symbols

WARNING Indicates a potentially hazardous situation or practice which, if not avoided, will result in serious injury or death.

CAUTION Indicates a potentially hazardous situation or practice which, if not avoided, could result in damage to the product or loss of important data.

Safety Terms on the Product

DANGER It calls attention to an operation, if not correctly performed, could result in injury or hazard immediately.

WARNING It calls attention to an operation, if not correctly performed, could result in potential injury or hazard.

CAUTION It calls attention to an operation, if not correctly performed, could result in damage to the product or other devices connected to the product.

1.3 Work Environment

Temperature
Operating: $0°C$ to $+50°C$
Non-operating: $-40°C$ to $+70°C$

Flow Rate
Minimum: 3 Litres/minute
Maximum: 25 Litres/Minute
Typical: 17 Litres/Minute
Uncertainty: ±0.1 Litres/Minute

Altitude
Operating: above 0.1 km

1.4 Care and Cleaning

Care
Do not store or leave the instrument where it may be exposed to extreme weather conditions for extended periods.

Cleaning
Clean the instrument regularly according to its operating conditions.

1. Disconnect the instrument from all power sources.
2. Clean the external surfaces of the instrument with a soft cloth dampened with mild detergent or water.

1.5 Software Requirement

A WiFi enabled web browser.
Complete support:

- Google Chrome
- Microsoft Edge
- Internet Explorer 12.0 and above

Partial Support:

- Mozilla Firefox
- Opera
- Safari (Partial support, some visuals might change)

2 Appearance and Controls

2.1 Dust Sampler structural Overview

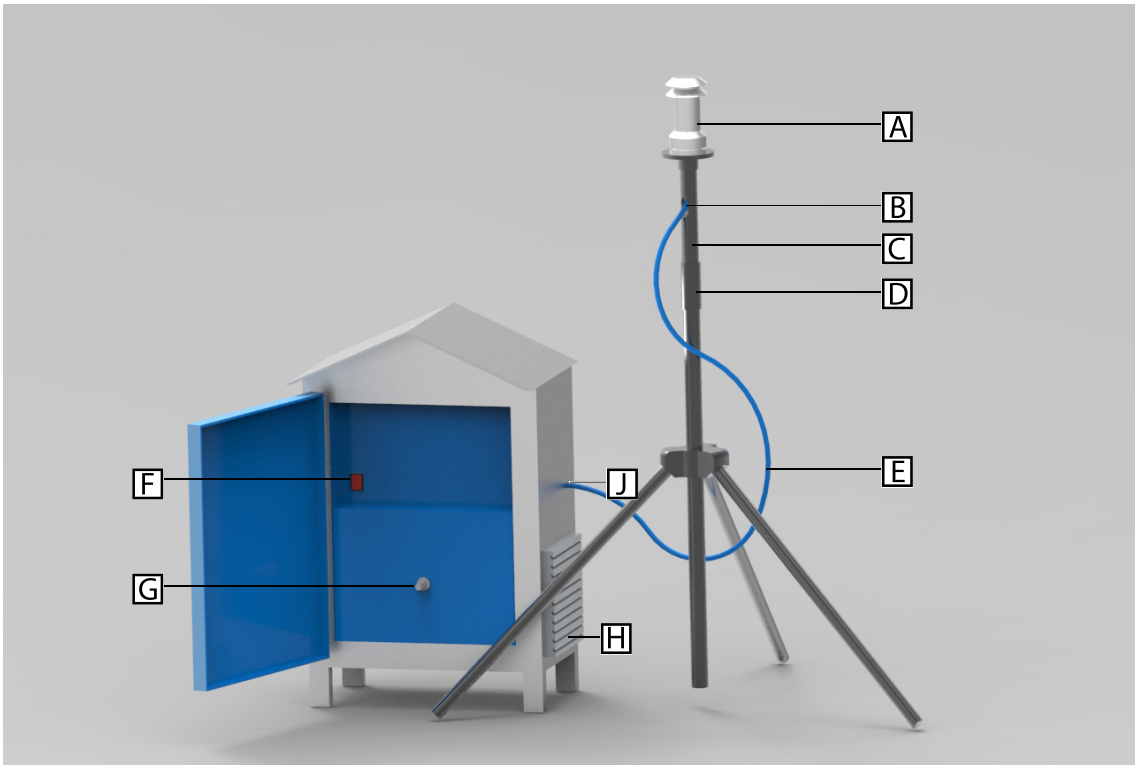

Figure 2.1: Schematic diagram of Dust Sampler control unit and PM head frame.

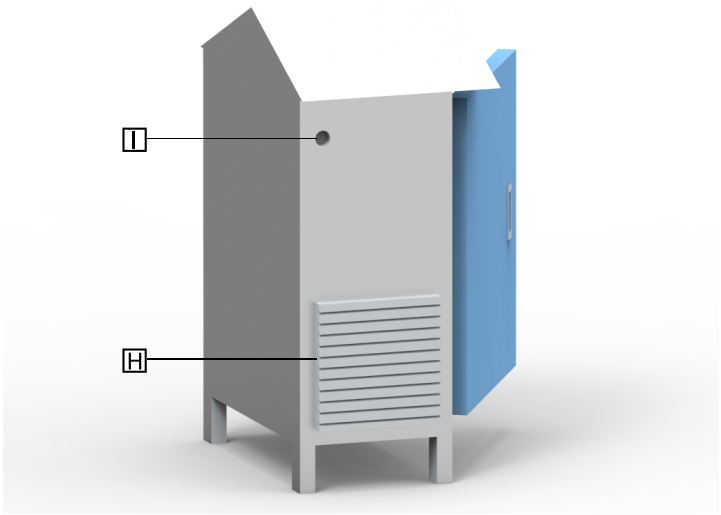

Figure 2.2: Side view of Dust Sampler control unit.

Number	Component and its description
A	**PM suction head** For air suction.
B	**Suction Outlet** Outlet pipe for sucked air.
C	**Frame** To support the structure and provide appropriate height to PM suction head.
D	**Frame height adjuster** To change the height of PM suction head.
E	**Pipe** For transfer of air from PM head to air inlet.
F	**Switch** To turn system ON and OFF.
G	**Flow rate valve** To control rate of air flow by controlling suction of pump.
H	**Filters** To maintain good air quality and provide appropriate ventilation system for produced heat.
I	**Power Input** Voltage input (220V) for the system.
J	**Air Inlet** Air inlet to control unit. Sucked air is passed through a filter from here and processed to show quality of air.

Table 2.1: All the major components of the Dust Sampler Unit and their functions.

2.2 Flow Diagram

Illustration 2.3 describes the air flow circuit in the dust sampler. Atmospheric air is sucked by the pneumatic pump inside the dust sampler and through flow circuit. The air first passes through PM2.5/PM10 filter and travels through the blue flexible tubing to the dust sampler chassis. Here is passes through the flow sensor before entering the suction pump.

For transportation and maintenance purpose, the tubing can be unmounted from the chassis by pressing the socket collar and gently and firmly pulling

the tube out of the socket. Please protect the terminal of the tubing from damage and dust when plugged out and take care of any leakage when plugging it back in.

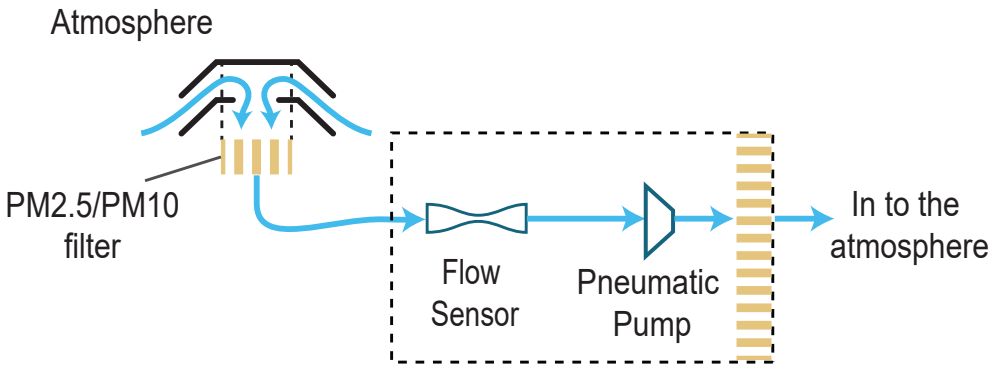

Figure 2.3: Pneumatic flow diagram of Dust Sampler.

2.3 Preparation for Operation

For the complete operation of the system one must understand both the hardware and software parts of the system. Following is a step-by-step guide about how to set up and operate the unit.

3 User Interface for Qosain Dust Sampler Software

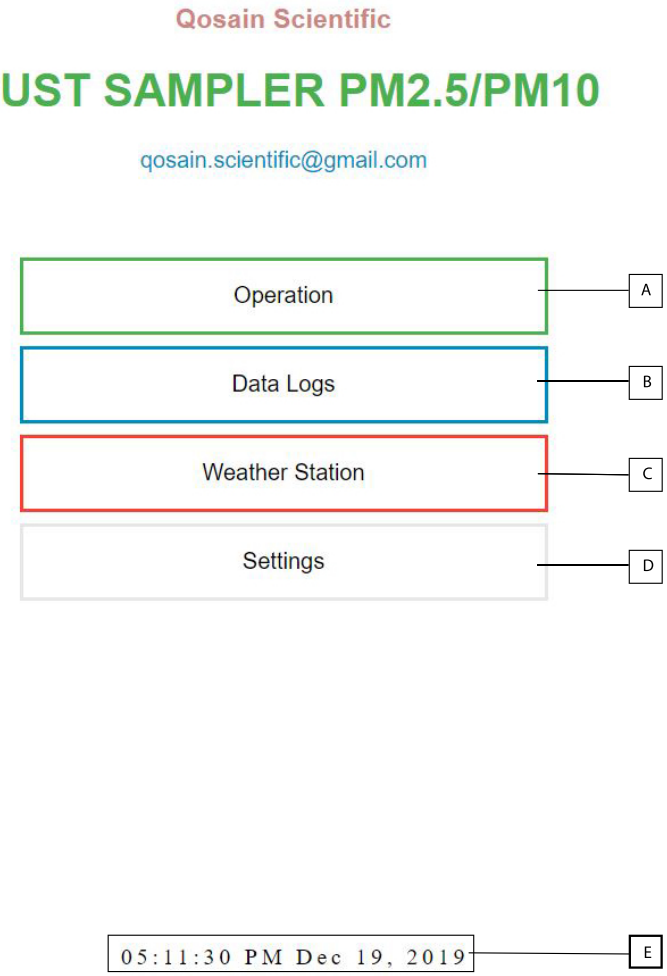

Figure 3.1: Screenshot for the user interface for Dust Sampler software.

Label	Description.
A	**Operation** is used to initiate a dust sampling procedure.
B	**Data Log** keeps a list of all the commenced logging sessions.
C	**Weather Station** is used for measuring atmospheric conditions.
D	**Settings** option can be used to change date and time of the system.
E	**Date and Time** current system date and time, refreshed every 5 seconds.

3.1 Connecting to the Dust Sampler UI

1. Place the dust sampler unit on a firm surface and connect it to power supply while following the safety measures.
2. Turn on the system by pressing ON switch inside control unit of dust sampler.
3. Next, connect using a WiFi-enabled smartphone or laptop, with the WiFi Hot-spot named "Qosain Dust Sampler" in the vicinity of the unit.
4. Open a web browser on connected device and enter "192.168.4.1" (without the quotes) in the web address. This opens up the default panel of the dust sampler unit.
   Note: The software provides partial support for safari. Some visuals of the program might change.
5. If the page doesn't load after a couple of seconds, try refreshing the page.

3.2 Initializing a Dust Sampling Session

1. Click/Tap the "Operation" button on the main screen. Please, refer to Figure 3.1 which shows a screen shot of the main screen.
2. The menu that appears asks for the dust sampling session duration and a maximum 25 characters long name for the data log. A screenshot is shown in Figure 3.2.
3. Once the parameters are set, press the start button to power up the pump and begin the logging session.
4. While a dust sampling session is running, the dust sampler shows an overview of several variables, as shown in Figure 3.3.
5. Since user can view the Flow rates of the pump, the flow rates can be adjusted by the rotary valve available on the front of the unit.
6. The dust sampling session can be paused/resumed at any stage by pressing "Pause"/
   "Resume" button on the menu displayed in Figure 3.3.

7. To terminate a dust sampling session, first "Pause" it and use the "Terminate" button displayed on the menu.

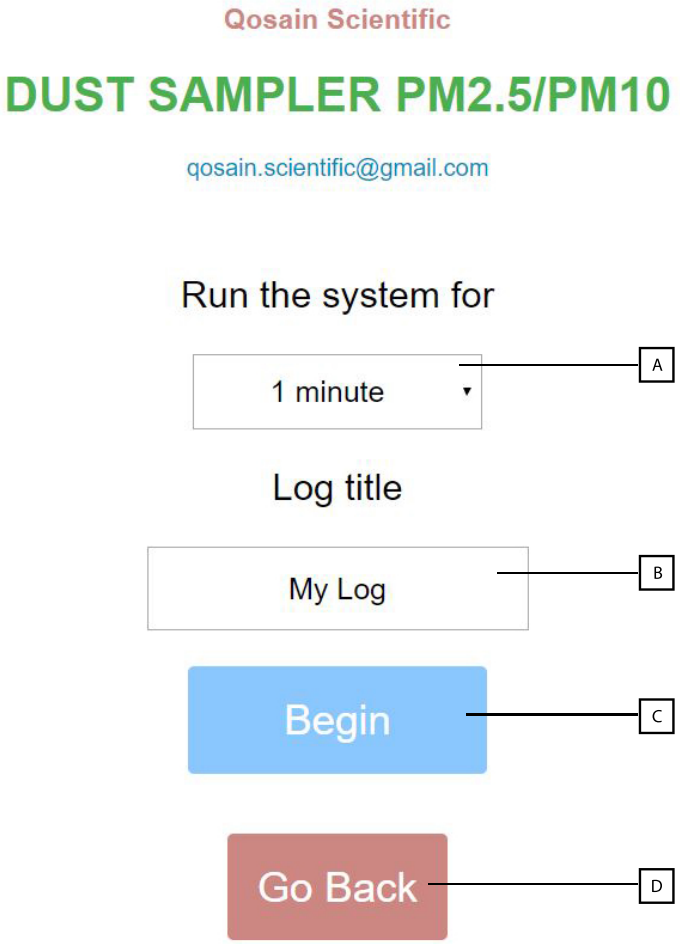

Figure 3.2: Screenshot for the user interface for Dust Sampler software. After pressing "Operation" button.

Label	Description.
A	**Time** drop down to set the time of the dust sampling session.
B	**Log Title** to set filename of the log file.
C	**Begin** button to power up the pump and start a dust sampling session.
D	**Go Back** button to go back in the main menu.

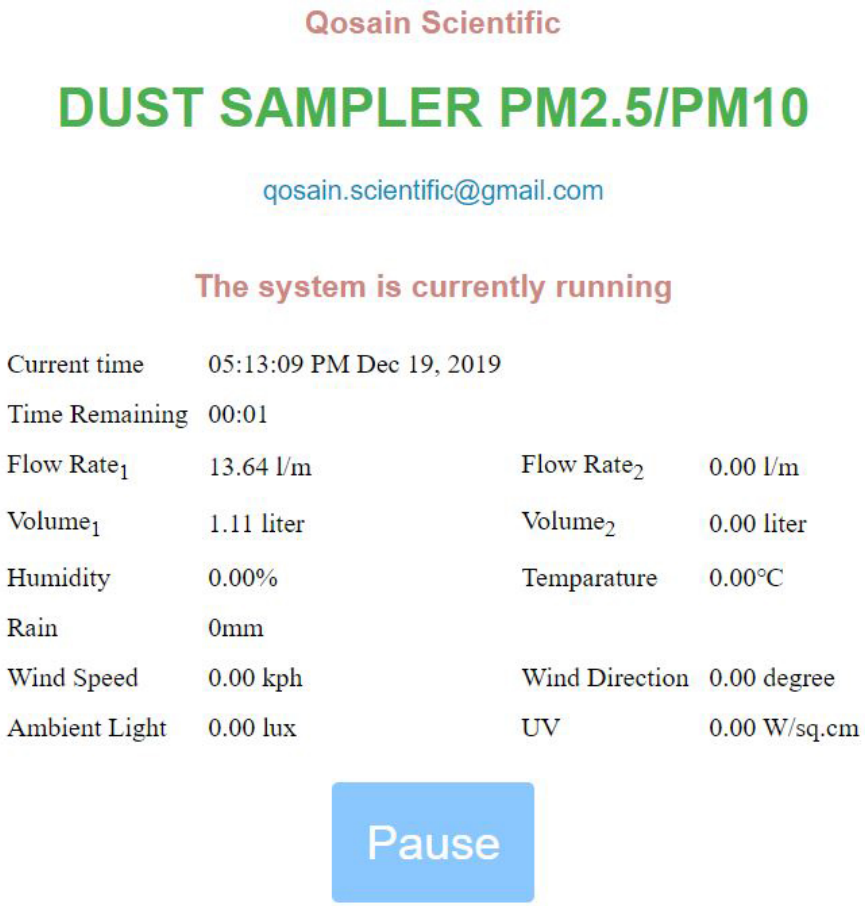

Figure 3.3: Screenshot for the user interface for Dust Sampler software. After pressing "Begin" button.

3.3 Power Failure Management

Power failure can be a big issue that can arise due to electrical breakdown or connection problems. If a user starts a dust sampling session for a certain period, and an electrical breakdown happens, the system will shut down, and no log data will be recorded. If the electrical power is resupplied to the system during the sampling period, the system will start the pump and keep recording the logs until the sampling period ends.

4 Viewing Data Logs

Data logs are saved in system memory and can be viewed and downloaded using "Data Log" option on the main menu. Refer to Figure 3.1 which shows a sample of the data logs list as it should normally appear.

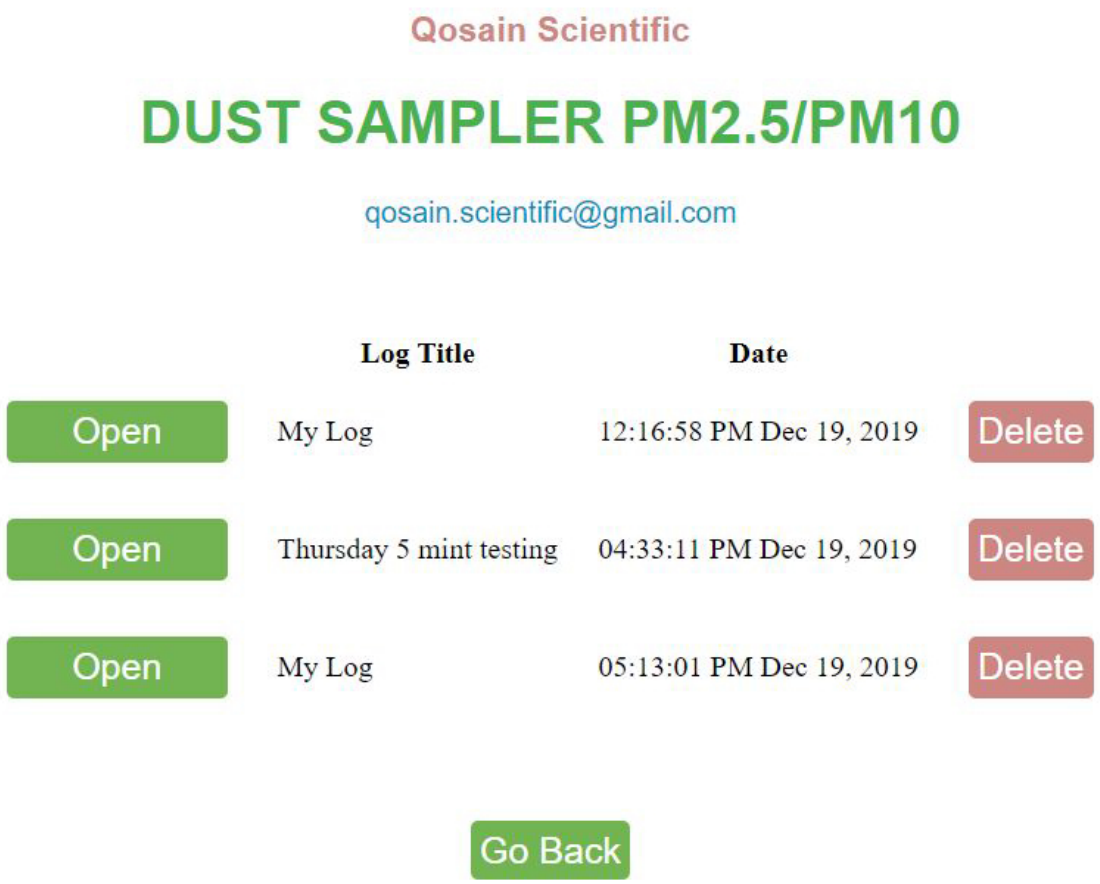

Figure 4.1: Screenshot for the user interface after pressing "Data Logs" button.

Logs can only be viewed when no dust sampling session is going on. Also note that the system memory can store a maximum of 15 days old log and a maximum of 100 log sessions at a time.

5 Weather Station and Settings

"Weather Station" button on the Main menu can be used to view and record atmospheric conditions to provide information for weather forecasts and to study the weather and climate. This button is available in Main Menu and can be viewed by referring to Figure 3.1. After pressing "Weather Station" button the following menu shall be opened.

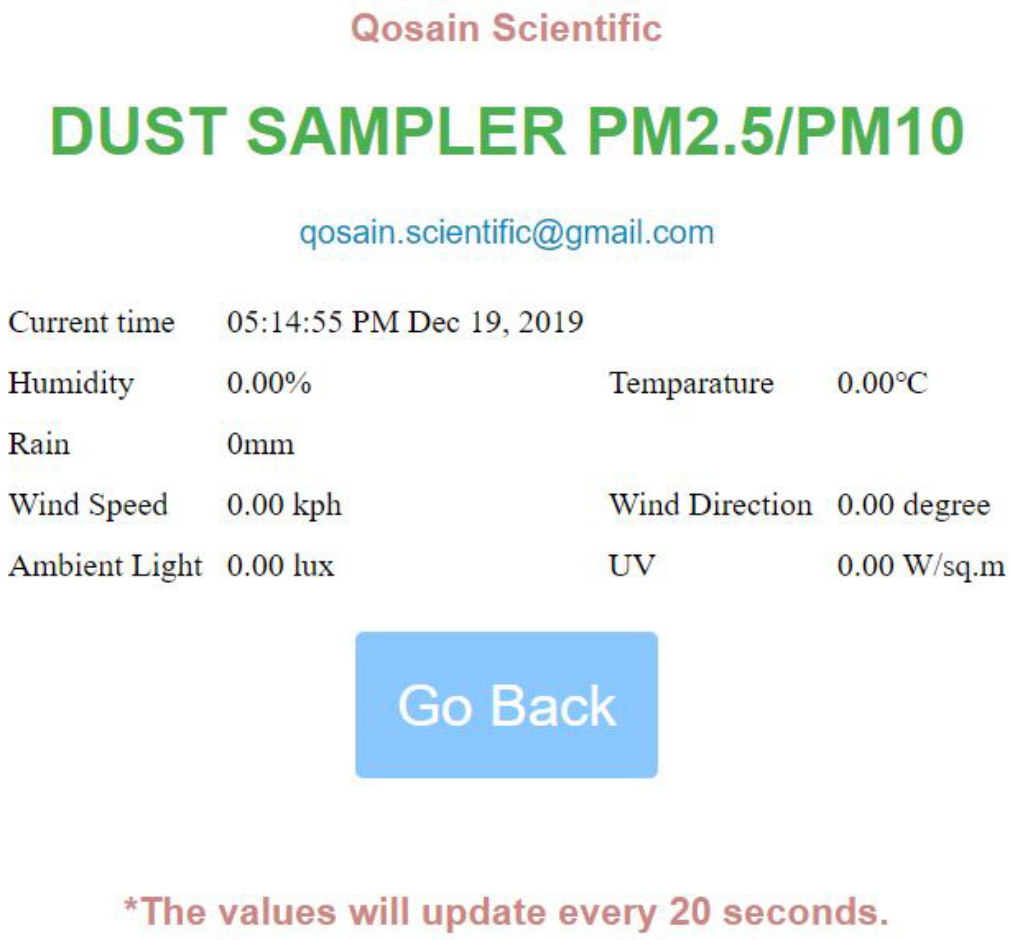

Figure 5.1: Screenshot for the user interface after pressing "Weather Station" button.

Setting button can be used to change time and date of the system. This button is available in Main Menu and can be viewed by referring to Figure 3.1. After pressing "Settings" button the following menu must be opened.

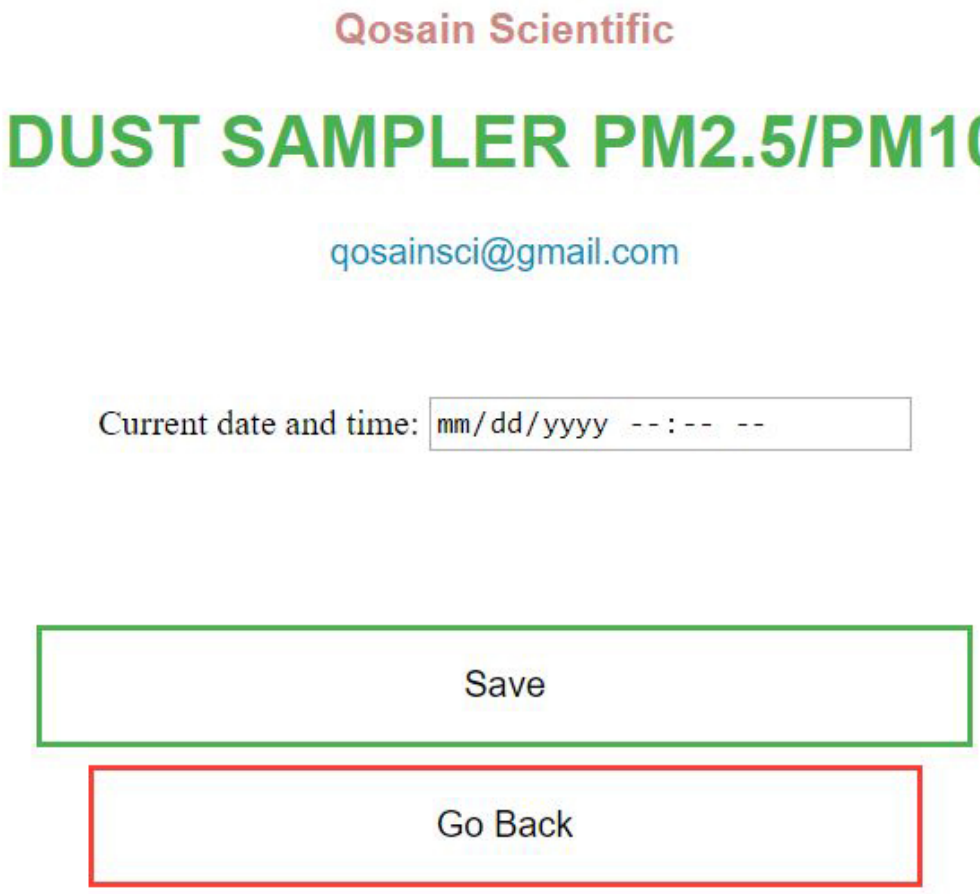

Figure 5.2: Screenshot for the user interface after pressing "Settings" button.

Use the drop-down menu to set system date and time. Please note that this menu wont appear on Safari or Mozilla Firefox. The entry must be saved by pressing "Save" button. User can go back to the main menu by pressing "Go Back" button, discarding any setting changes made on this menu.

6 Troubleshooting

- No WiFi hot-spot appears in the available networks.
  1. Make sure that the dust sampler is powered properly.
  2. Try moving as close as 1 meters to the unit.
  3. Toggle the dust sampler power OFF and ON by the power button. Wait 10 seconds after powering up for the network to appear.
- The system doesn't power up.
  1. Check the connections of the system. Please ensure the power supply is at recommended voltages.
  2. Check if the system is properly grounded.
  3. Make sure no wire is broken.An exclusive power cord with three pins should be used for the instrument.
- The system runs but the pump is not powering up.
  1. Check connections of the pump and make sure recommended supply is connected to the system.
- The pump keeps running even after stopping it from the web interface.
  1. Stop system immediately and check for any short circuits or any wire exposure.
  2. Make sure the connected device is in vicinity of the system and is properly connected.
- Weather station data isn't updating.
  1. Make sure weather station is properly connected to the system.
  2. Check if the weather station is broken or is malfunctioned due to handling or extreme weather conditions.
- The flow sensor shows 0 or more than 25 Litre/Minute Flow rate.
  1. Check if the rotatory valve is working or not.
  2. Make sure the sensor is not overheating or is exposed to extreme weather conditions.
- If above actions can't solve the issue, contact Qosain Scientific to see if your service plan can cover it.