soarability

Sniffer4D Mini2

Hyperlocal Mobile Multi-gas Detection & Mapping System

User Manual

V1.1 2023.01.09

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Disclaimer

Thank you for purchasing Soarability product(s). Before using Sniffer4D Mini2, please read the manual carefully to ensure that the product has been properly assembled and set up. To obtain the latest User Manual, please visit Soarability's official website (www.soarability.tech/index_en), and carefully read all the instructions, warnings and function upgrades in the manual. Failure to follow the instructions and warnings in the manual or lack of safety awareness during operation may damage Sniffer4D Mini2 or other items, and may even cause harm to you and others around you. If Sniffer4D Mini2 needs to be integrated with aircrafts, ground vehicles and other moving plateforms for use, you must receive systematic training and practical learning to obtain the corresponding license. SZ Soarability Technology LLC (Soarability) reserves the right to the final explanation of this User Manual and all other relevant documents for Sniffer4D Mini2.

The document is subject to update, revision or discontinuation without notice. Please visit Soarability's official website for the latest product information.

Product names and brands in this manual including "Soarability", "Sniffer4D" and "Sniffer4D Mapper" are trademarks or registered trademarks of SZ Soarability Technology LLC.

Export Compliance Disclaimers

You are required to comply with applicable export control laws, and you will be solely liable for any violation of export control laws resulting from your use, sales, gift, rental, or other acts of Sniffer4D Mini2 and its relevant products. Soarability will not be responsible for your violation of export control laws under any circumstances. You shall ensure that Soarability and its affiliates, managers, employees, distributors, and representatives are exempt from any legal liability or damage caused by your aforementioned actions, or bear any relevant expenses, including but not limited to litigation fees, attorney fees, travel expenses, etc.

No Disassemble Without Permission

All Sniffer4D Mini2 units are well-calibrated and strictly tested before delivery. Please do not disassemble, adjust or modify its internal structure, and do not add other sensing modules. Soarability will not provide warranty services for the damages

caused by unauthorized disassembly, but will still be able to provide charged repair and maintenance services. If you have any needs, please contact the Sales Support Engineer of Soarability.

Use Official Integration Kit for Installations

The official integration kits have been delicately designed for adaption and passed long-term tests for compatibility, so that there is no mutual interference between Sniffer4D Mini2 and the platform. Soarability will not be responsible for any interference, fall, or damage caused by the use of non-official integration kits.

Safety in Use

Please ensure that you install, set up, and use Sniffer4D Mini2 correctly. Please read the User Maunal and watch the tutorial video on Soarability's official YouTube channel to learn how to install Sniffer4D Mini2 on the platform properly.

By using Sniffer4D Mini2, you are deemed to have carefully read the disclaimer and the contents of this document, understood and accepted all terms of this and other relevant documents for Sniffer4D Mini2. You agree to take full responsibility for all possible consequences from your use of Sniffer4D Mini2 (on aircrafts, ground vehicles and other moving plateforms). You shall use Sniffer4D Mini2 for legitimate purposes only, and agree on the relevant regulations, policies and guidelines made by Soarability.

Soarability will not be responsible for the damage, injury, and any legal liability caused directly or indirectly by the use of Sniffer4D Mini2, or for the inappropriate use of the moving platforms and the violation of local laws and regulations. Users should follow all safety guidelines including but not limited to those mentioned in this document.

Storage and Transportation

1. Sniffer4D Mini2 and its accessories include small screws and fittings, please keep them out of reach of children to avoid accidental swallowing.
2. Please place Sniffer4D Mini2 in its original carrying case to avoid falling after the mission.
3. To maximize the service life of the internal sensors, please place Sniffer4D Mini2 in an environment with clean air, keep the humidity between 20-75%, temperature between -10~30° C, and avoid direct sunlight.

4. When shipping Sniffer4D Mini2, please add anti-collision foam or bubble wrap around the carrying case to prevent damages caused by improper handling. Please transport Sniffer4D Mini2 by land carriage since the low temperature at high altitude during air transport may damage the electrochemical sensors inside the device.
5. If traveling by plane, please place the Sniffer4D Mini2 in your hand luggage (the cabin will keep the temperature at around 25°C) instead of a checked baggage (the temperature in the baggage compartment may be as low as -40 °C , which may cause irreversible damage to the sensors).

Ⅰ. Manual Tips

1.1 Quick Search and Download

Search Text (Ctrl+F)

PDF documents support searching texts by keywords. In Adobe Reader, click the icon or use the shortcut Ctrl + F on Windows, and use Command + F on Mac to search for texts.

Click the Table of Contents or Bookmark

You can skip to the corresponding content page by clicking the Table of Contents, or clicking the bookmark icon and skip to a specific page through the bookmarh link.

Print Documents

The documents support high-resolution printing.

Download Sniffer4D Mapper

Please register and login to your account on https: //www.sniffer4d.com, and download "Sniffer4D Mapper" by clicking the button in the bottom left corner.

Scan the QR codes to follow Soarability's official LinkedIn account and subscribe Soarability's official YouTube channel for more information.

1.2 Icons

Forbidden	Failure to operate in accordance with the specifications may cause irreversible damage to the product. Damage caused by improper operation will not be covered by the warranty service.
Warning	Sniffer4D Mini2 may not work properly if operations are not performed in accordance with the specifications.
Tip	Product operation and usage tips.

II .Product Overview

2.1 Introduction

Sniffer4D Mini2 consists of a multi-gas detection hardware and powerful analytic software. This system is able to measure and visualize real-time 3D gas concentration distributions. By providing timely & actionable information, Sniffer4D helps first responders, oil & gas industry, environmental agencies, and researchers improve work efficiency, mitigate risks, and reduce costs.

Sniffer4D Mini2 is able to obtain up to 9 gas concentration distributions at one time. Users can flexibly choose or alter their sensor configurations that suit their applications and budgets.

Typical Parameters for Ambient Air Monitoring						
PM2.5	PM10	SO_2	CO	NO_2	O_3	VOC_s
Other Parameters						
CxHy / CH_4 / LEL			H_2S	O_2	NH_3	HCl
HCN	HF	H_2	Cl_2	PH_3	NO	CO_2
Odor (OU)		#Other Customized Parameters...				

Contact Soarability for more details.

See Your Real-time Data, Anywhere

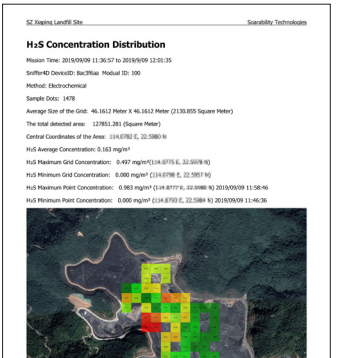
Sniffer4D Mini2's built-in cellular connectivity enables secure real-time data transmission with unlimited range to decision makers in different locations.

Advanced Real-time Visualization

Sniffer4D Mapper software visualizes and analyzes data from one or more Sniffer4Ds in real time, providing intuitive & insightful information for decision makers.

One-click Result Delivery

After a mission, simply click a button to generate a mission report containing key results, or a CSV file containing all the raw data. Reporting your work has never been easier.



SZ Xiaping Landfill Site — Soarability Technologies

H₂S Concentration Distribution

Mission Time: 2019/09/09 11:36:57 to 2019/9/09 12:01:35

Sniffer4D DeviceID: Bac3f6aa Modual ID: 100

Method: Electrochemical

Sample Dots: 1478

Average Size of the Grid: 46.1612 Meter X 46.1612 Meter (2130.855 Square Meter)

The total detected area: 127851.281 (Square Meter)

Central Coordinates of the Area: 114.0782 E, 22.5980 N

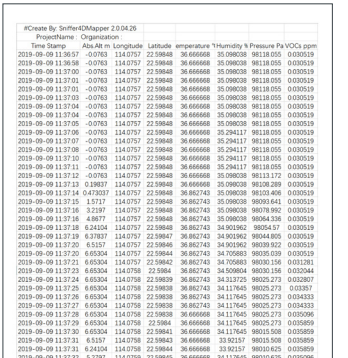
H₂S Average Concentration: 0.163 mg/m³

H₂S Maximum Grid Concentration: 0.497 mg/m³(114.0775 E, 22.5978 N)

H₂S Minimum Grid Concentration: 0.000 mg/m³ (114.0798 E, 22.5957 N)

H₂S Maximum Point Concentration: 0.983 mg/m³ (114.0777 E, 22.5988 N) 2019/09/09 11:58:46

H₂S Minimum Point Concentration: 0.000 mg/m³ (114.0793 E, 22.5984 N) 2019/09/09 11:46:36



#Create By: Sniffer4DMapper 2.0.04.26

ProjectName : Organization :

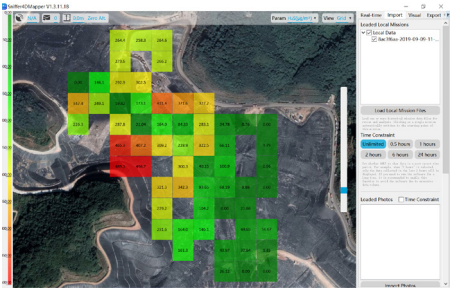
Time Stamp	Alps Alt m	Longitude	Latitude	emperature	°tHumidity %	Pressure Pa	VOCs ppm
2019-09-09 11:36:57	-0.0763	114.0757	22.59848	36.666668	35.098038	98118.055	0.030519
2019-09-09 11:36:58	-0.0763	114.0757	22.59848	36.666668	35.098038	98118.055	0.030519
2019-09-09 11:37:00	-0.0763	114.0757	22.59848	36.666668	35.098038	98118.055	0.030519
2019-09-09 11:37:01	-0.0763	114.0757	22.59848	36.666668	35.098038	98118.055	0.030519
2019-09-09 11:37:01	-0.0763	114.0757	22.59848	36.666668	35.098038	98118.055	0.030519
2019-09-09 11:37:03	-0.0763	114.0757	22.59848	36.666668	35.098038	98118.055	0.030519
2019-09-09 11:37:04	-0.0763	114.0757	22.59848	36.666668	35.098038	98118.055	0.030519
2019-09-09 11:37:04	-0.0763	114.0757	22.59848	36.666668	35.098038	98118.055	0.030519
2019-09-09 11:37:05	-0.0763	114.0757	22.59848	36.666668	35.098038	98118.055	0.030519
2019-09-09 11:37:06	-0.0763	114.0757	22.59848	36.666668	35.294117	98118.055	0.030519
2019-09-09 11:37:07	-0.0763	114.0757	22.59848	36.666668	35.294117	98118.055	0.030519
2019-09-09 11:37:08	-0.0763	114.0757	22.59848	36.666668	35.294117	98118.055	0.030519
2019-09-09 11:37:10	-0.0763	114.0757	22.59848	36.666668	35.294117	98118.055	0.030519
2019-09-09 11:37:11	-0.0763	114.0757	22.59848	36.666668	35.294117	98118.055	0.030519
2019-09-09 11:37:12	-0.0763	114.0757	22.59848	36.666668	35.098038	98113.172	0.030519
2019-09-09 11:37:13	0.19837	114.0757	22.59848	36.666668	35.098038	98108.289	0.030519
2019-09-09 11:37:14	0.473037	114.0757	22.59848	36.862743	35.098038	98103.406	0.030519
2019-09-09 11:37:15	1.5717	114.0757	22.59848	36.862743	35.098038	98093.641	0.030519
2019-09-09 11:37:16	3.2197	114.0757	22.59848	36.862743	35.098038	98078.992	0.030519
2019-09-09 11:37:16	4.8677	114.0757	22.59848	36.862743	35.098038	98064.336	0.030519
2019-09-09 11:37:18	6.24104	114.0757	22.59848	36.862743	34.901962	98054.57	0.030519
2019-09-09 11:37:19	6.37837	114.0757	22.59847	36.862743	34.901962	98044.805	0.030519
2019-09-09 11:37:20	6.5157	114.0757	22.59846	36.862743	34.901962	98039.922	0.030519
2019-09-09 11:37:20	6.65304	114.0757	22.59844	36.862743	34.705883	98035.039	0.030519
2019-09-09 11:37:21	6.65304	114.0757	22.59842	36.862743	34.705883	98030.156	0.031281
2019-09-09 11:37:23	6.65304	114.0758	22.5984	36.862743	34.509804	98030.156	0.032044
2019-09-09 11:37:24	6.65304	114.0758	22.59839	36.862743	34.31725	98025.273	0.032807
2019-09-09 11:37:25	6.65304	114.0758	22.59838	36.862743	34.117645	98025.273	0.03357
2019-09-09 11:37:26	6.65304	114.0758	22.59838	36.862743	34.117645	98025.273	0.034333
2019-09-09 11:37:27	6.65304	114.0758	22.59838	36.862743	34.117645	98025.273	0.034333
2019-09-09 11:37:28	6.65304	114.0758	22.59838	36.666668	34.117645	98025.273	0.035096
2019-09-09 11:37:29	6.65304	114.0758	22.5984	36.666668	34.117645	98025.273	0.035859
2019-09-09 11:37:30	6.65304	114.0758	22.59841	36.666668	34.117645	98015.508	0.035859
2019-09-09 11:37:31	6.5157	114.0758	22.59843	36.666668	33.92157	98010.625	0.035859
2019-09-09 11:37:31	6.24104	114.0758	22.59844	36.666668	33.92157	98010.625	0.035859
2019-09-09 11:37:32	5.2797	114.0759	22.59845	36.666668	34.117645	98010.625	0.035096
2019-09-09 11:37:34	4.0437	114.0759	22.59846	36.666668	33.92157	98025.273	0.035096
2019-09-09 11:37:35	1.1597	114.0759	22.59846	36.666668	34.117645	98059.453	0.035096
2019-09-09 11:37:35	2.53304	114.0759	22.59846	36.666668	34.117645	98044.805	0.035096
2019-09-09 11:37:36	-0.0763	114.0759	22.59846	36.666668	34.117645	98074.109	0.034333
2019-09-09 11:37:37	-0.0763	114.0759	22.59846	36.666668	34.117645	98088.758	0.03357
2019-09-09 11:37:38	-0.0763	114.0759	22.59846	36.470589	34.313725	98093.641	0.03357
2019-09-09 11:37:39	-0.0763	114.0759	22.59846	36.470589	34.313725	98093.641	0.032807
2019-09-09 11:37:40	-0.0763	114.0759	22.59846	36.470589	34.313725	98093.641	0.032807
2019-09-09 11:37:42	-0.0763	114.0759	22.59846	36.470589	34.313725	98098.523	0.032807
2019-09-09 11:37:43	-0.0763	114.0759	22.59845	36.470589	34.313725	98098.523	0.032044

2.2 Typical Applications

Please refer to some typical applications below to learn how Sniffer4D Mini2 works in actual scenarios.
You can get more information on the application through Soarability's official website: www.soarability.tech/index_en.

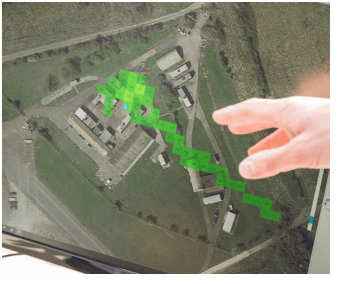
Hyper-local Environmental Monitoring
Quickly scan through an area (e.g. residential area, industrial park, construction buildings road etc.) and obtain its hyper-local air pollution distribution in 3D. The results can be used to pin down exact locations of suspected fugitive emission sources, to understand how air pollution are transported, and so on.

Gas Leaks Detection
Efficiently gather distribution information of certain gases in oil & gas, pipline inspection and landfills. Use the information to locate suspected leakage spots, identify the spread of harmful substances, and minimize the risk caused by limitation of the terrain or manual climbing.

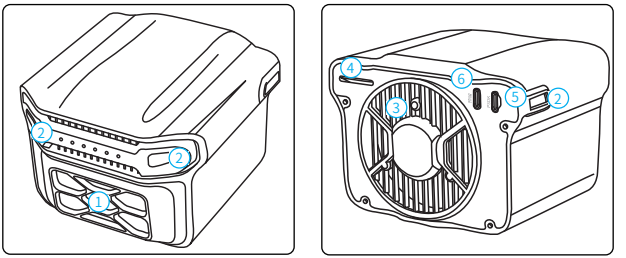


HAZMAT Response

In an event of an emergency, before putting the health and safety of your team at risk, fly Sniffer4D Mini2 into the scene to quickly identify the types and spreads of toxic gases, and define a safety perimeter.



2.3 Main Components



1. **Active Air Intake Filter**
   The filter on the front side of Sniffer4D Mini2 can filter floating objects in the air, and with the active air intake fan, the air intake volume is approx. 10L/min flow rate when subject to zero additional resistance.

2. **Front High-brightness RGB Warning LEDs**
   The LEDs can be configured or set to automatically change colours according to the real-time gas/PM concentrations.
   Besides, you can configure and adjust LED On/Off, LED Blink, Blink Freq. and LED Mode on Sniffer4D Mapper and DJI Pilot. For more details, please refer to 6.1 High-brightness Warning LEDs on P49.

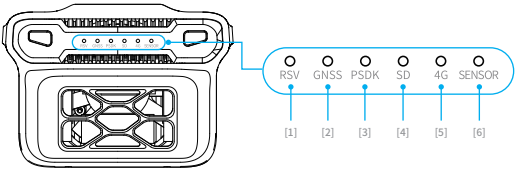
3. **Fan**
   Active air intake fan, which should not be blocked.

4. **MicroSD Card Slot and NanoSIM Card Slot, dual card slot.**
   Sniffer4D Mini2 is equipped with a 16GB MicroSD card (supporting up to 32GB) that can continuously record ＞ 4100 hours of monitoring data. When the warm-up is completed and the GNSS signal is fixed, the data (in .s4d format) will be automatically backed up in the SD card.
   No SIM card provided. For GPRS/EDGE/3G/4G real-time data transmission, please prepare a SIM card with cellular data yourself and set the APN in the Config file of the SD card.

5. **PSDK Port**
   24V power input from DJI aircraft.
   The PSDK port is specifically used for power supply from a DJI M30 aircraft, please do NOT connect it to other power supplies through a USB-C cable.

6. **Reserved Port**
   The port is preliminary used for data transmission.

2.4 Status LEDs



Normal status

No.	Indicator	Status
[1]RSV	● ··· Solid	Receiving data from sensors
[2]GNSS	● ··· Solid	The GNSS signal is good and can be positioned
[3]PSDK	● ··· Solid	Successfully connected to the aircraft via PSDK
[4]SD	● ··· Solid	Data is being written into the SD card
[5]4G	○●○●··· Blink quickly	Data is being transmitted
[6]SENSOR	● ··· Solid	The internal main program started normally

Warm-up and abnormal status

No.	Indicator	Status
[2]GNSS	○·●·○·●· Blink	GNSS signal is poor and cannot be positioned*
[3]PSDK	○·●·○·●· Blink	Not communicating with the aircraft through PSDK
[4]SD	○·●·○·●· Blink	Sniffer4D Mini2 is warming up / the GNSS signal is poor * / the SD card storage is full (please copy the data before deleting)
[5]4G	○··· Off	No SIM card inserted / no cellular data in the SIM card
	●···○···●···○··· Blink slowly 1	Long on and short off - searching network**
	○···●···○···●·· Blink slowly 1	Short on and long off - no data transmission***

* Please place Sniffer4D Mini2 in an open and interference-free environment to get the GNSS signal fixed. Note that the time for getting the first GNSS fix may increase when Sniffer4D Mini2 is more than 700km away from the last start-up position.
** Searching network, normally in poor signal conditions.
*** No data being transmitted from the sensors to the 4G module. Please contact the sales support engineer.

Sniffer4D Mini2 has NO built-in GNSS, and the GNSS indicator indicates the working status of the external GNSS (UAV GNSS or external GNSS module).

III. Getting Started with Sniffer4D Mapper

3.1 Create and Login to Soarability Account

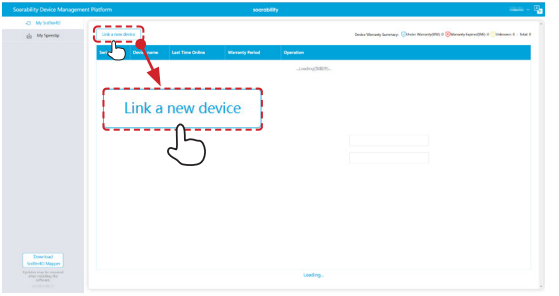
Please create a new account through www.sniffer4d.com. If you already have a Soarability account, please login by entering your e-mail /account and password.

If you have not registered a Soarability account, please click "Sign up", enter your e-mail address, and click "Get Code", the system will automatically send a 6-digit verification code to your e-mail (within 3 minutes). After creating your account and setting the password, click "Sign up" to complete the registration.

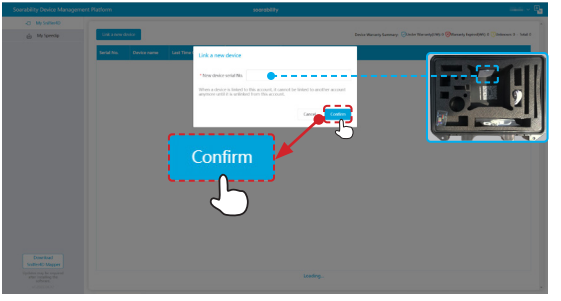
If you do not create an account name during registration, the system will use your e-mail address as the account name by default.

3.2 Link a Sniffer4D Mini2 to an Account

Return to the login page, enter your e-mail/account and password to enter the "Soarability Device Management Platform". Click "Link a new device" and enter the new device serial No. The serial number is on the Certificate of Compliance inside of the carrying case (the Certificate is attached to the inner lining of the case, and you can find it after taking out Sniffer4D Mini2).

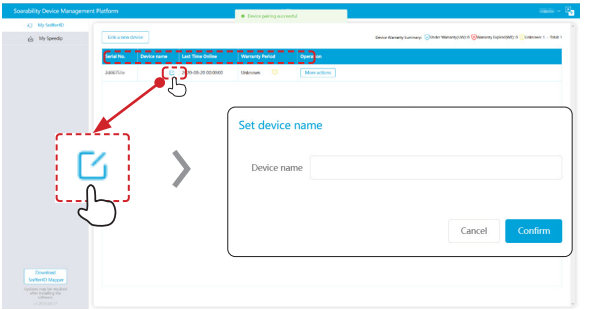


Enter the complete serial number of your Sniffer4D Mini2 in the pop-up window, click "Confirm" and the window will prompt "Device linking successful", indicating that Sniffer4D Mini2 has been linked to your account.



- Each Sniffer4D Mini2 can only be linked to one account at a time. After linking the account, you can view the real-time data on Sniffer4D Mapper, you can also get the production date, warranty period, last online time and last known location (geographic location information) of your Sniffer4D Mini2.
- **The serial number is a hexadecimal number, please note that there is no letter "O", "I", "L" but "0" and "1" in the serial number.**

After linking completed, Sniffer4D Mini2 interface under the submenu of "Soarability Device Management Platform" will display your Sniffer4D Mini2 Serial NO., Device Name, Last Time Online, Warranty Period, and Operation (More actions).
To better manage the devices under your account, you can set and modify the device name of each device. Device name setting supports in Chinese, English and numbers.

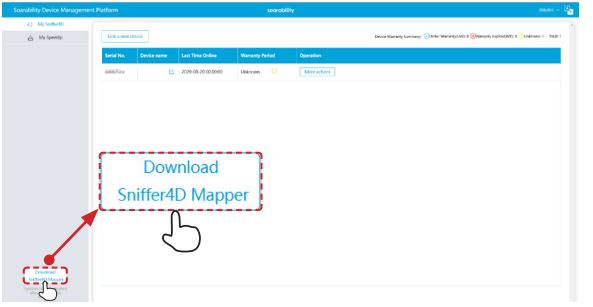


3.3 Download and Install Sniffer4D Mapper on a Computer

Sniffer4D Mapper requires Windows 10 64-bit operating system and above. To ensure the normal operation of Sniffer4D Mapper on the computer, the recommended hardware configuration is as follows.

Configuration requirements	Minimum configuration	Recommended configuration
CPU	Intel Atom Quad Core	Intel i5
RAM	4GB	8GB
Screen Resolution	768p	1080p

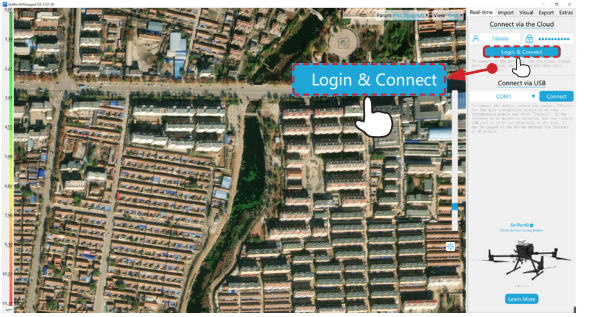
Click the "Download Sniffer4D Mapper" button in the bottom left corner of the Soarability device management platform to download the Sniffer4D Mapper installer.



· For details of Sniffer4D Mapper installation, please refer to Chapter 5 Sniffer4D Mapper Data Visualization and Analysis Software on P31.

3.4 Connect Sniffer4D Mini2 to Sniffer4D Mapper

After installation completed, enter your Soarability account and password on the main interface, and click "Login & Connect". Please note that the Cloud data transmission can only be used when Sniffer4D Mini2's network communication is normal (the 4G status LED blinks quickly) and the computer is connected to the Internet.



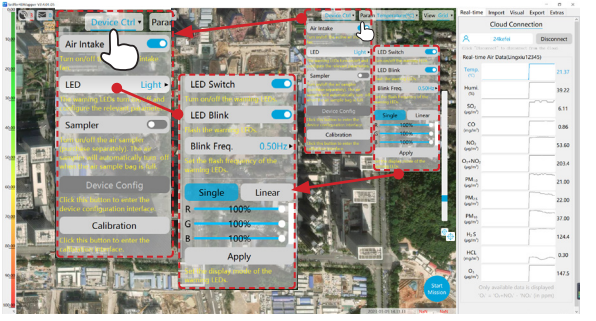
For integration with the platform and power supply, please refer to Chapter 4 Platform Integration on P27.

When Sniffer4D Mini2 works properly, network communication is normal (the 4G status LED blinks quickly), and the computer is connected to the Internet, you can view the real-time data through Sniffer4D Mapper. When the GNSS signal is good, the icon "S" will appear on the map, which indicates the location of Sniffer4D Mini2, and the geographic coordinate information will appear in the bottom right corner of the map.

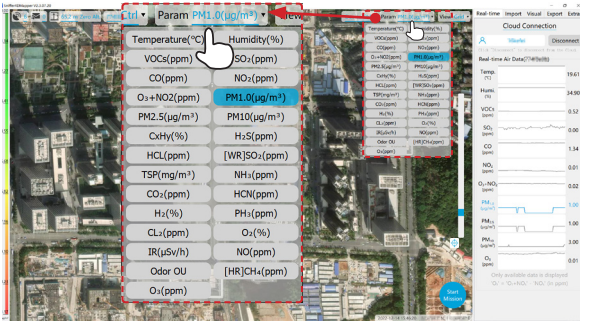
3.5 Functions of Sniffer4D Mapper

You can freely adjust the functions of Sniffer4D Mini2 on the Sniffer4D Mapper operation interface.

"Device Ctrl" drop-down menu: You can adjust or control the hardware functions of Sniffer4D Mini2 on the premise of understanding the application of each function.

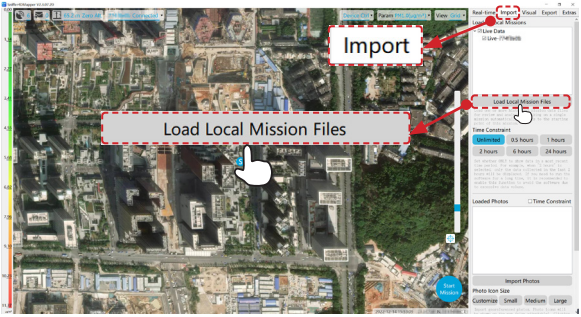


"Param" drop-down menu: After selecting a parameter, the grid concentration heat map will generate the concentration distribution accordingly.



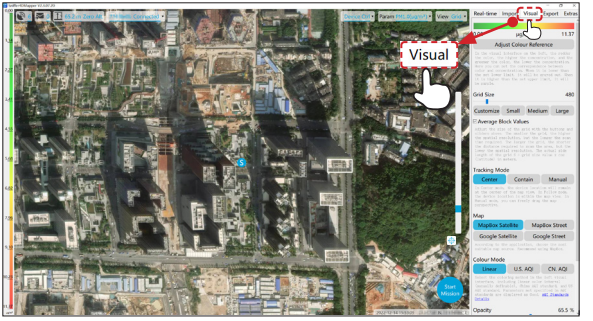
"View" drop-down menu: Support generating three types of data visualization maps including 2D grid, 2D isoline, and 3D point cloud. You can switch among the three types of maps at will.

"Import" panel: Support loading multiple historical mission files into the software for post analysis.

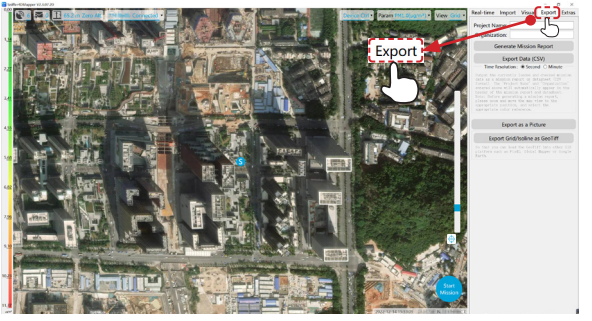


- Sniffer4D Mapper will save the historical mission files to: "C: /Users/[admin]/Documents/Sniffer4D Mapper/[Version]", the default file name is: "Sniffer4D Mini2 Device name - Serial number - Mission date & time".
- Please note that the storage path will change after you update the Sniffer4D Mapper.

"Visual" panel: You can adjust the visualization display for different applications such as grid size, colour reference of concentration, opacity, map source, etc.

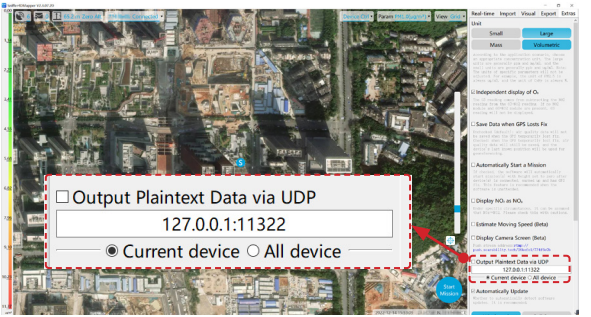


"Export" panel: You can generate a PDF mission report or CSV data file, and export as picture or GeoTiff file with geotag from the loaded mission files.



⚠ · When operating on "Export" panel, you need to finish the current mission and load the mission files you need to analyze into the software.

"Extras" panel: Here you can adjust the measurement unit, configure more functions and output plaintext data via UDP.



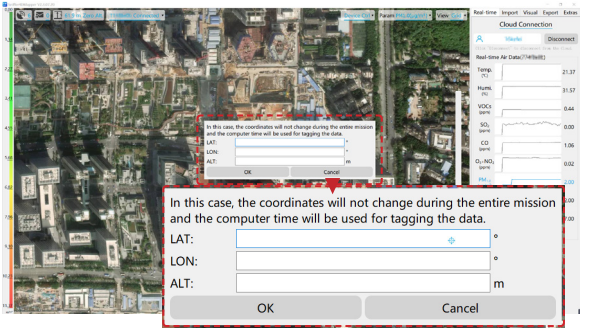
3.6 Start a Mission

When both the 4G and GNSS signals are good, click "Start Mission" in the bottom right corner of the main interface, and you should see a grid appear on the map.

⚠
- Make sure that Sniffer4D Mini2 is within the visual range of the map, or you can set "Tracking Mode" to "Center" or "Contain" on the "Visual" panel.
- The grid may be indistinct if the grid size is over-small or the visual range of the map is over-wide.

When there is no GNSS signal, you can perform a fixed-point mission by manually inputting coordinate information. Click "Start Mission" and the pop-up window will prompt "The Sniffer4D can not determine its location. Manually input the coordinates and execute the mission anyway?", please select "OK".

Enter the latitude, longitude and current relative altitude in the window, and click "OK" to start the mission.



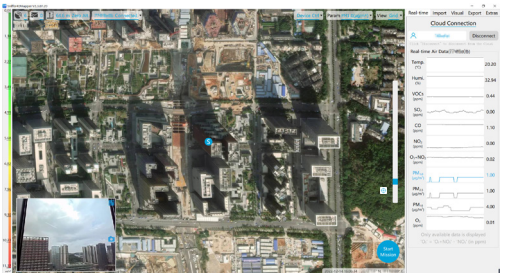
- During the fixed-point mission, the timestamp of the data will be given by the computer, while in regular missions, the timestamp of the data will be given by the satellite.
- During the fixed-point mission, the latitude, longitude and altitude information recorded in the mission will remain unchanged even if the GNSS is acquired later.

3.7 Screen Recording

After starting mission, you can perform screen recording to save the information of concentration, location, and working environment. For the introduction of video live streaming, please refer to 5.4 Main Interface on P37.

After screen recording, the video files will be saved in the following categories:

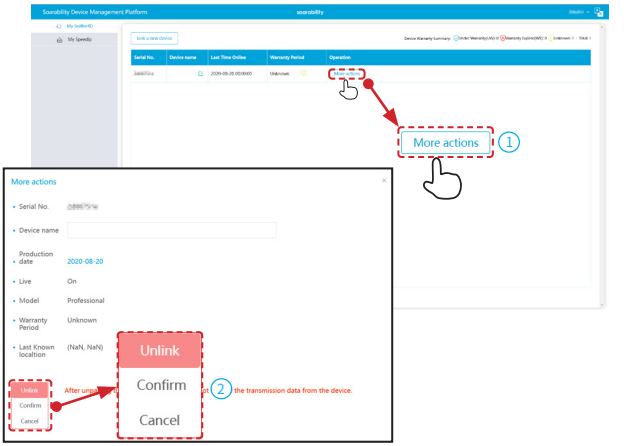
C: /Users/Admin/Documents/Sniffer4D Mapper/ScreenRecord



· The screen recording file is in MP4 format, and the default file name is "Serial number - screen recording start date and time".

3.8 Unlink a Sniffer4D Mini2

If you would like to link an already-linked Sniffer4D Mini2 to a new account (when reselling for example), you can click "My Sniffer4D Mini2" - "More actions" in the "Soarability Device Management Platform" to perform the "Unlink" operation.



- If you would like to resell the Sniffer4D Mini2 unit, please unlink it from your account. Or your customer can not link the Sniffer4D Mini2 to a new account to acquire monitoring data and relevant information.

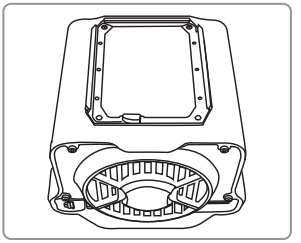
IV . Platform Integration

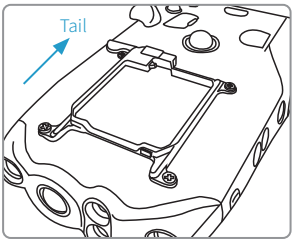
4.1 Integration with DJI M30 Aircraft

The steps of how to integrate Sniffer4D Mini2 onto a DJI M30 aircraft are as follows. You can directly view the real-time concentration data on DJI Pilot.

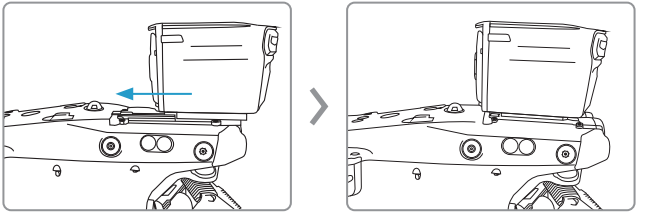
Installation

1. Install the mounting bracket A on the top of the flipped Sniffer4D Mini2, as shown in the lower left picture. Note that the bugled end should be facing the tail of Sniffer4D Mini2.
2. Place the mounting bracket B onto the mounting holes in the M30, as shown in the lower right picture. Note that the side with a locker should be facing the tail of DJI M30 aircraft.

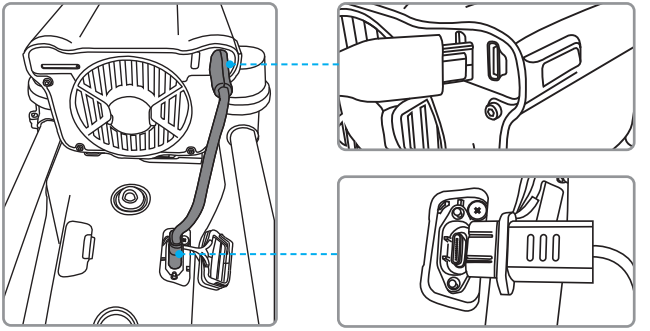




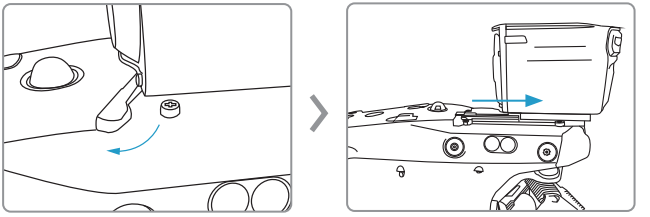
3. Align the bracket A on the bottom of Sniffer4D Mini2 with the bracket B on the top of M30, and push Sniffer4D Mini2 inwards. It is considered to be firmly installed and locked when you hear a snap sound.



4. Connect one end of USB-C cable to the PSDK port at the back of Sniffer4D Mini2, and connect the other end of the cable to the OSDK port at the top of M30.



5. To remove Sniffer4D Mini2 from M30, simply flip the locker handle on the mounting bracket B and slide the Sniffer4D Mini2 forward.

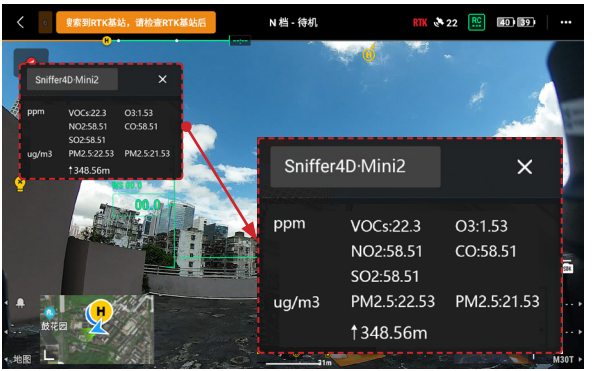


· After the installation is completed, please refer to 4.2 Check the Communication between Sniffer4D and DJI Pilot on P29.

4.2 Check the Communication between Sniffer4D and DJI Pilot

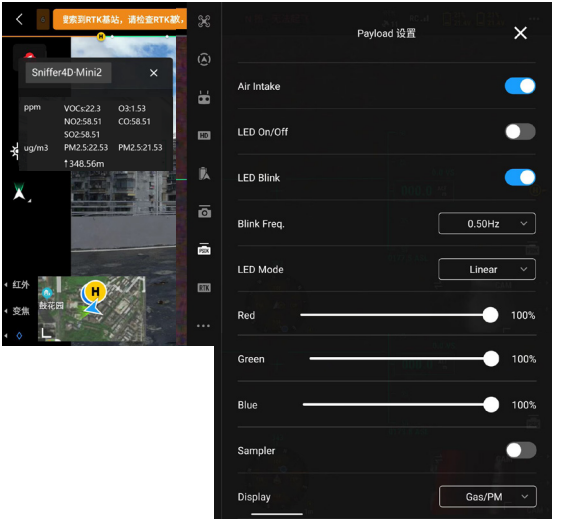
1. Turn on the aircraft, then turn on the remote control of the aircraft and DJI Pilot App. The welcoming interface should display "Sniffer4D-PSDK", indicating that Sniffer4D Mini2 has established communication with the aircraft.

2. Click "Manual Flight" to enter the camera view in DJI Pilot App, and the small floating window will display the real-time readings of Sniffer4D Mini2. The floating window position can be adjusted at will. If "Sniffer4D-PSDK" is not displayed on the DJI Pilot when Sniffer4D Mini2 works properly, you can exit the DJI Pilot and enter again.



3. Click Settings icon in the top right corner and enter "Payload Settings" to configure your Sniffer4D Mini2.

- "Display Real-time Data" is enabled by default. Real-time concentration readings willbe displayed on DJI Pilot when Sniffer4D Mini2 is working properly.
- "Air Intake" is enabled by default. Please turn it off when performing calibrations with standard gases, using the ground vehicle integration kit or using other external air intake pumps.
- "LED On/Off" turns on/off the front and rear high-brightness RGB warning LEDs of Sniffer4D Mini2. It should be turned off by default to reduce heat and power consumption.
- "LED Blink" is turned on by default. The warning LEDs will blink if it is on, and will stay solid if off.
- "Blink Freq." defaults to 2Hz, which means that the warning LEDs blink once every 0.5 seconds. You can click to modify the blink frequency of the warning LEDs.
- "LED Mode" defaults to "Single", which means that the colour of the warning lights does not change with the gas/PM concentration, and you can configure the RGB value for the colour of the warning lights on Sniffer4D Mapper. Click and switch to
- "Liner", the colour of the warning LEDs will automatically change with the gas/PM concentration.
- "Sampler" is disabled by default and is enabled only when the gas sampling module (sold separately) is applied.



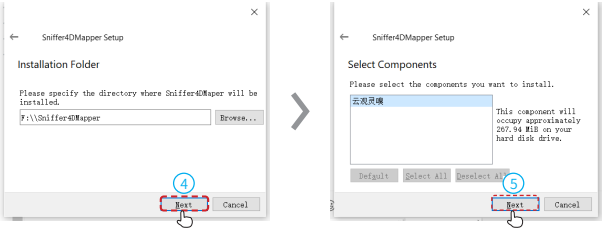
V . Sniffer4D Mapper Data Visualization and Analysis Software

5.1 Software Installation and Precautions

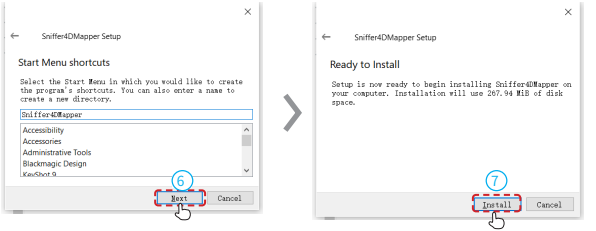
Download and install Sniffer4D Mapper. Please create a Soarability account, and login to download the software installer (for the registration process, please refer to 3.1 Create and Login to Soarability Account on P15).
Visit www.sniffer4d.com and login to your account.

1. Unzip the installer, open the folder and double-click Sniffer4D Mapper. exe to run the installation file;
2. When a warning window pops up, click [Run];
3. When "Setup-Sniffer4D Mapper" pops up, click [Next];

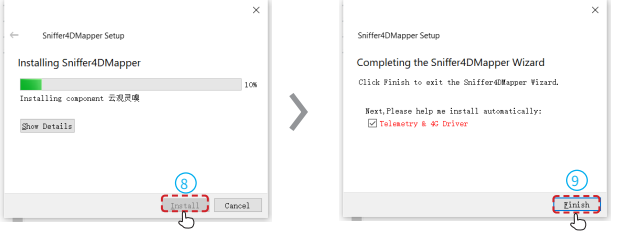
4. You can modify the installation path through this pop-up window, install the software to the specified disk folder, and click [Next];
5. When the "Select Components" window pops up, click [Next];



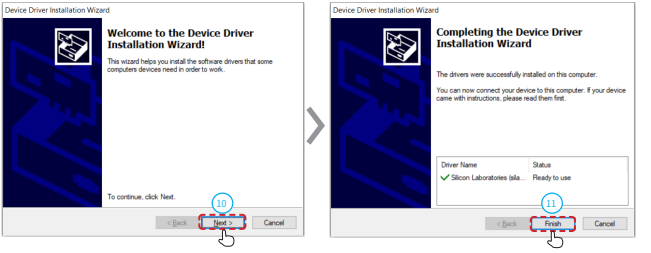
6. When "Start Menu Shortcut" pops up, use the default settings and click [Next];
7. When "Ready to Install" pops up, click [Install];



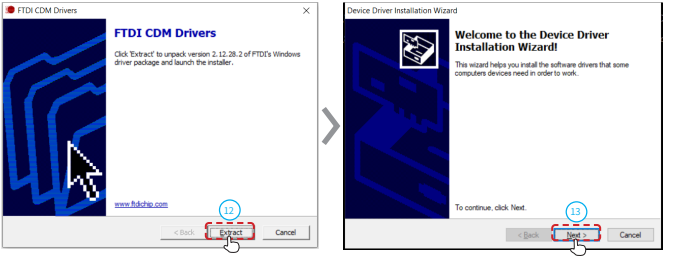
8. After the installation is completed, "Installing Sniffer4D Mapper" will pop up, click [Next];
9. When "Completing the Sniffer4D Mapper Wizard" pops up, accept the default settings and click [Finish];



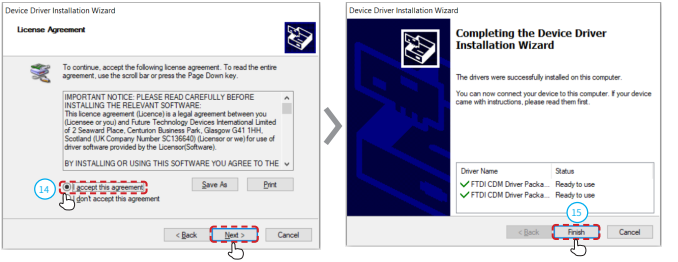
10. The pop-up window will prompt "Welcome to the Device Driver Installation Wizard", click [Next];
11. Click [Finish];



12. When the "FTDI CDM Drivers" window pops up (USB to multi-interface chip driver), click [Extract];
13. Click [Next];



14. When the "License Agreement" pops up, be sure to select "I accept this agreement", and then click [Next];
15. When the "Completing the Device Driver Installation Wizard" pops up, click [Finish];



⚠ · To install the device driver properly, be sure to select "I accept this agreement" in "Step 14".

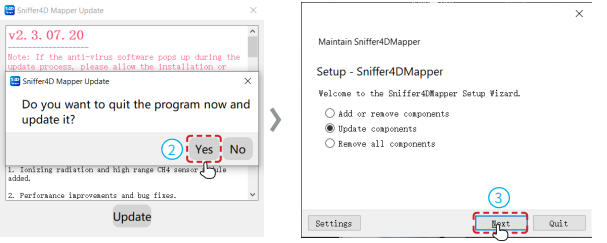
16. After the installation is completed, double-click the Sniffer4D Mapper icon on the desktop to open the software.

5.2 Software Update

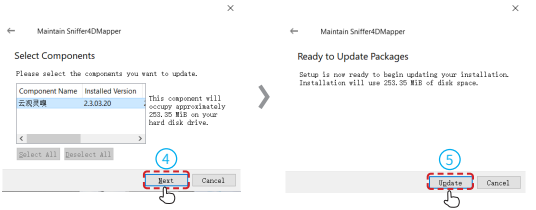
After opening Sniffer4D Mapper, an update window will pop up automatically if there is a new version. We recommend all users to update the software in time to get the latest functions. The software release-documentation is displayed in the pop-up window.

1. Click [Update];

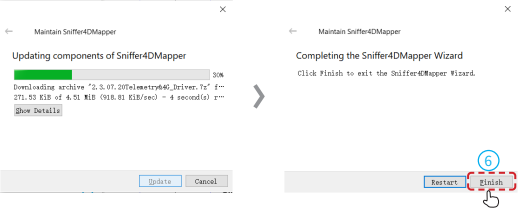
2. When the pop-up window prompts "Do you want to quit the program now and update it?", click [Yes];
3. When the "Setup-Sniffer4D Mapper" window pops up, accept the default settings and click [Next];



4. When the "Select Components" pops up, accept the default settings and click [Next];
5. Click [Update];



6. When the "Updating components of Sniffer4D Mapper" window pops up, please wait until the update is completed. After that, click [Finish], and Sniffer4D Mapper will re-start within a few seconds.



· The storage path of Sniffer4D Mapper may change after the upgrade.

5.3 Login Interface

Each time you start the software and enter the login interface, you can view the software version number, account Login & Connect, Connect via USB, and information about Soarability products, etc.

1. Sniffer4D Mapper Version No.

Displays the version number of the current software, the last four digits represent the release date of the software (for example, Mini2.3.04.21 means that the software was released on April 21).

2. Account Login & Connect / Disconnect

Click to login and connect to your Soarability account or disconnect the current account. (for details of account registration, please refer to Chapter 3 Getting Started with Sniffer4D Mapper on P15).

3. Connect / Disconnect via USB

When the Radio Telemetry and Direct Connect Module (DCM) are connected, choose the correct COM to get the real-time data of Sniffer4D Mini2.

4. Info Bar

The latest products of Soarability will be displayed here. You can click [Learn More] to enter the detailed introduction webpage of the product.

5. Visualization Panel

- Displays the working status, device control, parameters and views of Sniffer4D Mini2.
- Login to your account when Sniffer4D Mini2 is turned on and the GNSS signal is good, the panel will display the location of your Sniffer4D Mini2 in real-time (coordinate information is displayed in the bottom right corner).
- After starting a mission, real-time data will be displayed in the grid map by default.

5.4 Main Interface

When Sniffer4D Mini2 is linked to your account and the communication has been turned on normally, the following information will be displayed on the main interface after logging in to your account:

1. GNSS Satellite Number

The number of satellites acquired. The more the number of satellites, the more accurate the positioning will be; Sniffer4D Mini2 can work normally if more than 4 satellites acquired.

2. Data to be Transmitted

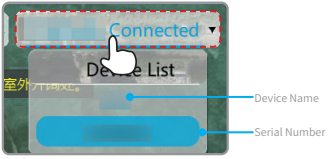
The amount of data that has not been retrieved yet. When the network or radio telemetry communication is interrupted, the data measured by your Sniffer4D Mini2 will not be lost, and will be automatically retrieved after the communication is reconnected.

3. Relative Altitude

The relative altitude of the device (inversely calculated from air pressure). You can click the "Zero Alt." button to reset the height to zero and the principle is similar to the "Reset" of an electronic scale. If you connect Sniffer4D Mini2 to the aircraft though PSDK, this value represents the relative altitude from the take-off position, and the altitude will be consistent with the altitude displayed on DJI Pilot.

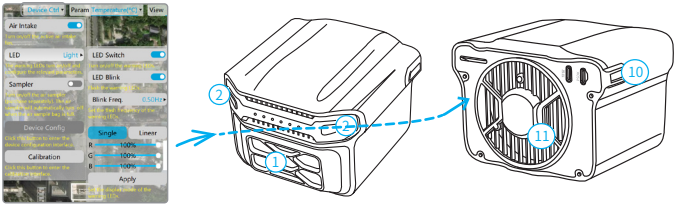
4. "Device list" Drop-down Menu

Display the online device name, serial number and connection status of the device that is currently linked to your account. Click the drop-down box to view your device name and serial number at any time. When your account is linked to more than one Sniffer4D Mini2 and they are working properly, you can choose another device at will to check the working status.



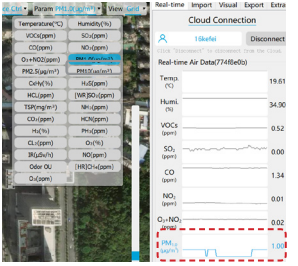
5. "Device Ctrl" Drop-down Menu

- **Air Intake**
  Turn on/off active air intake fan of the device. It is turned on by default and should be turned off when the device is being calibrated. In addition, it should be turned off when using the GV integration kit or other external pumps.
  As shown in the picture, ① is the air intake, which turns on/off the active air intake fan of the device and controls the operation of ⑪ the air outlet fan.
- **LED On/Off**
  Turn on/off the high-brightness warning LEDs (when there is no need to warn onsite staffs or surrounding people, it is recommended that you turn off the LEDs to save power and reduce heat).
- **LED Blink**
  The high brightness warning LEDs turn solid or blink.
- **Blink Frequency**
  The blink frequency of the high brightness warning LEDs.
- **LED Mode**
  Single, linear, Set the display mode of the LEDs.
  The LEDs have front ② and rear ⑩ RGB LEDs as shown in the pictures below.
- **Clibration**
  Click and enter Sniffer4D Mini2 calibration interface. Please end all missions before calibrations. For specific calibration methods, please refer to Chapter 7 Sniffer4D Mini2 Calibration on P59.



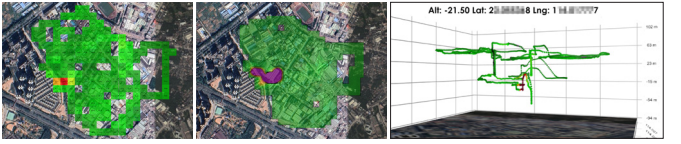
6. "Param" Drop-down Menu

You can choose the monitoring parameters included in your Sniffer4D Mini2 (if Sniffer4D Mini2 you purchased does not have the corresponding sensing module, the graph of the real-time data will not be displayed). As shown in the picture, the "PM" chosen in the "Param" drop-down window is the monitoring parameter currently viewed.



7. "View" Drop-down Menu

Three view maps for option: grid map, isoline map, 3D point cloud map. Click "View" to switch.



2D Grid
Indicate the real-time concentration value of the current area.

2D Isoline
Help analyze gas diffusion trends.

3D Piont cloud
Indicate gas concentration distribution at different height.

· In the 3D point cloud map, double-click any ordinate axis to adjust the interval of the ordinate axis, and click any data point to display the latitude, longitude and altitude of the current position.

· If no data is displayed after switching to the isoline map, the possible reasons and solutions are as below:

① Historical mission files of different regions are loaded at the same time, causing overload calculation of the computer. In this case, you need to remove unnecessary historical mission files, and then switch to the isoline map again.

② Adjust to a larger grid size to reduce the calculation for generating isoline maps.

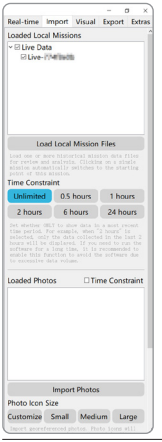
8. "Real-time" Panel

When the device is turned on and working properly, login to the account and select the Sniffer4D Mini2 unit you desire, the data panel will display the change graph of the monitoring parameters in real-time and the horizontal axis duration is 100 seconds.

9. "Import" Panel

- **Load local mission files:**
  Load one or more historical mission files for review and analysis.
- **Import photos**
  Georeferenced photos can be loaded and displayed in the map along with gas concentration distribution.
- **Load Geo Tiff**
  If the satellite map is too old or the resolution is too low, you can load Geo Tiff and lay gas concentration distribution on the Geo Tiff.

The specific operations are as below:



Load from local files

After performing and finishing a mission with Sniffer4D Mapper on your computer, the system will automatically save the mission file in the computer's local file (.s4d format). You can load a single file or multiple files simultaneously.

The storage path is "C: /Users/[Admin]/Documents/Sniffer4D Mapper/[Version]", the default file name is "Sniffer4D Mini2 device name - serial number - Mission date & time".

Loading files from Sniffer4D Mini2 SD card

Remove the SD card from the SD card slot, read it with a card reader, and load the historical mission data files (.s4d format) .

Time Constraint

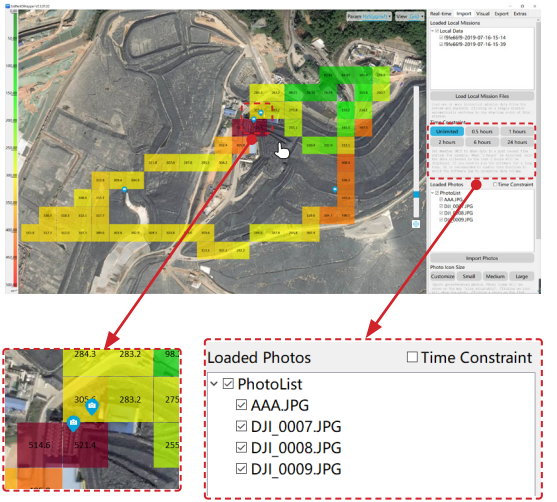
To make it easier to view historical data in a certain period of time (e.g. the past 24 hours), you can click on Time Constraint for a quick selection. Besides, when there is a large amount of data, limiting the time range will also allow the software run more smoothly.

- The SD card slot has similar design as a snap hook, which can be fixed/popped out by gently pushing with your fingertip.
- When inserting the SD card, please push it in the direction indicated on Sniffer4D Mini2, "Words up, chip down, and notch right".
- The storage path may change after upgrading Sniffer4D Mapper.
- If the mission takes too much time, the data will be recorded hourly and kept separately in the format of ".s4d".

- SD card will automatically save the mission data when the sensors warm-up is completed and get the GNSS fixed.

Import Photos

Photos with geotags can be loaded. The photos will not be loaded successfully if there are no geotags, and the loaded photo will appear in the "Loaded Photos" list. When you click the photo in the list, it will automatically jump to the location of the photo and the location will be displayed on the map. The icon size can be adjusted by the "Photo Icon Size" and you can click the photo icon to view the photo.
This function makes it easy to diagnose and analyze the abnormal values in real-world view.



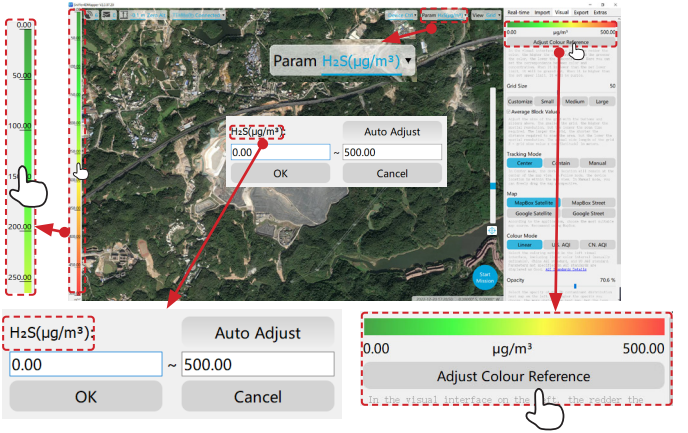
Load Geo Tiff

If the resolution of the satellite map of the monitoring area is too low or does not match the actual site, you can load an orthomosaic (.tiff format, WGS84 coordinate system) with geographic information tag in the software.

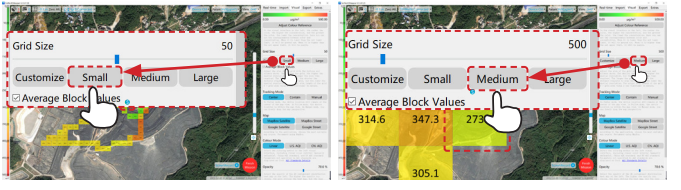
As shown in the picture (the satellite map of the monitoring area in the top picture, and the inserted orthophoto image in the bottom picture):

10. "Visual" Panel

· Adjust Colour Reference: In linear mode, you can click the colour bar above the "Adjust Colour Reference" or the colour bar on the left to set the concentration colour representation.



· **Grid Size:** Adjust the size of the grid with the buttons and sliders. You can either choose Custom, Small, Medium, Large, or slide the slider. Please note that due to the stretching of the planimetric map, the actual side length (m) = grid size value × cos (latitude) .



· **Tracking Mode:** You can set to keep Sniffer4D Mini2 in the center of the map (Center), keep Sniffer4D Mini2 within the visual range of the map (Contain), and freely drag visual range of the map with your mouse (Manual).

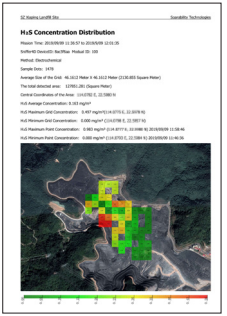
· **Map:** Choose the most suitable map source according to different scenarios. Google is recommended.

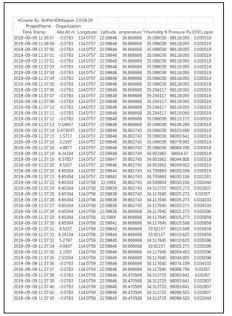
· **Colour mode**: Set to Linear, U.S. AQI, or CN. AQI.
Select the colouring method for visualization including Linear (default), U.S. AQI, or CN. AQI.

· **Opacity**
Select the opacity of the 2D contaminant distribution heat map on the left. The higher the opacity you choose, the more obvious the heat map, but the less visual the map layer below.
As shown below, the left image indicates opacity with a low value, while the right image indicates opacity with 100% value.

· **Alt. Interval**
You can choose to display only data within a relative height range.

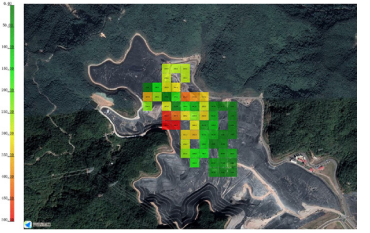
11. **"Export" Panel**
Before exporting, you can enter project name and organization information, which will be included in the exported file.
· Generate Mission Report: You can generate a PDF mission report, see an example (left picture) below.
· Export Data (CSV): You can export a CSV data sheet, see an example (right picture) below.





· **Export as a Picture:**

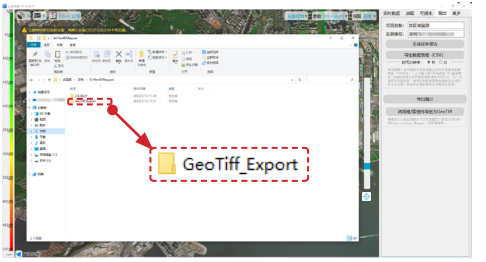
Export the current map (within visual range) and visualization information as PNG images. Please see a sample picture below. The indicated information on the picture is accordance with what you set in the Sniffer4D Mapper, and the file name will be "Project Name + Organization" by default.



· **Export Grid/Isoline as GeoTiff**

You can generate the visualized concentration distribution as an orthophoto with geographical information, and you can import the orthophoto into other GIS platforms (e.g. Pix4D, Global Mapper, Google Earth, etc.). The picture below is an example.

File saving path: C: /Users/[username]/Documents/Sniffer4D Mapper/GeoTiff_Export.



12. "Extras" Panel

- **Unit**
  According to application scenario, choose an appropriate concentration unit. The large units are generally ppm and mg/m3, and the small units are generally ppb and μg/m3. Note the units of specific parameter will not be adjusted. For example, the unit of PM2.5 is always μg/m3, and the unit of CxHy is always %.
- **Independent display O3**
  Checked by default. The O3 reading comes from subtracting the NO2 reading from the O3+NO2 reading. If no NO2 module and O3+NO2 are present, O3 reading will not be displayed.
- **Save Data when GNSS Losts Fix**
  Unchecked by default; you can check this function as needed.
- **Automatically Start a Mission**
  Checked by default. If checked, the software will automatically start missions with Height set to zero after device(s) is connected, warmed up and has GNSS fix (support connection to multiple Sniffer4D Mini2). This function is recommended when the software is unattended.
- **Display NO2 as NOx**
  Checked by default. Under specific circumstances, it can be assumed that NOx ≈ NO2. Please check this with cautions.
- **Estimate Moving Speed (Beta)**
  When checked, Sniffer4D Mapper will use the Kalman filter to estimate the moving speed of Sniffer4D Mini2.
- **Display Camera Screen (Beta)**
  Push stream address: rtmp: //push.soarability.tech/[user name]/ [serial]. We will take DJI M300 aircraft as an example for practical operation.
- Enter DJI Pilot, click "Cloud Service" - "Customized Live Stream" - enter "RTMP Address" (the stream address on Sniffer4D Mapper).
- Enter the push address, click "Confirm" in the upper right corner.

· You can click the" " icon to zoom in or zoom out the video screen. Click the" " icon to take a screenshot.

· The camera view live streaming to Sniffer4D Mapper will consume additional traffic, you need to connect DJI Pilot to a WIFI or wireless network adapter.

- **Output Plaintext Data via UDP**
  This function can decode the encrypted data from Sniffer4D Mini2 into plaintext data and transmit it to a designated IP address through the UDP protocol. For the specific setting method, please refer to 6.4 Plaintext Output Through Sniffer4D Mapper (UDP) on P57.
- **Automatically Update**
  Checked by default. Whether to automatically detect software updates.
- **Windowed/Full Screen**
  The software window display or full screen display; you can also enter and exit full screen by clicking F11.
- **Clear Local Map Cache**
  You can clear local map cache saved on your computer to release space or obtain new versions of online maps.
- **Run Demo Missions**
  Gain a better understanding of the software's features, or showcase this software to your client more intuitively by running the built-in demo missions (drone mounted, car mounted, and helicopter mounted).
- **Video Tutorial**
  You can learn from the tutorial videos on our YouTube channel for skillful use of Sniffer4D Mini2 or other products from Soarability.
- **Language**
  The language setting follows the system language by default; you can change the language of Sniffer4D Mapper as needed (restart the software). To change the software language, please disconnect the COM first.

13. Account Login
Login&Connect/Disconnect your Soarability account.

14. Real-time data (Sniffer4D Mini2 device name)
The real-time data window displayed by default when Sniffer4D Mini2 is working properly.

15. Map Zooming Bar
Slide up to zoom out and slide down to zoom in the map.

16. Target

Click to set Target on the map. The direction and distance to the Target will be displayed on DJI Pilot and the pilot can fly the aircraft to the designated location according to the information. Click again to lock the target, click once more to cancel the target setting.

17. Start a Mission

When Sniffer4D Mini2's 4G communication is normal and GNSS signal is good, you can click the button to start/finish the mission.

18.Coordinate Information

When your Sniffer4D Mini2 connects to 4G properly and has GNSS fixed, Sniffer4D Mapper will automatically display the latitude and longitude information.

19. Date and time of the last set of valid data

Indicate the time information when Sniffer4D Mapper receives the last set of valid data (the timestamp from the GNSS module of Sniffer4D Mini2 instead of that from computer,). If you find that Sniffer4D Mini2 has been disconnected after you are away from the computer, you can estimate the disconnection time based on the timestamp.

20. Sniffer4D Mini2 Location

When Sniffer4D Mini2 connects to 4G properly and gets GNSS fixed, the" S "icon will show on the map.

21. Map Source

You can choose the map source in the "Visual" panel.

22. Adjust Colour Reference

Same as the "Adjust colour reference" function of the "Visual" window.

VI . Extra Functionalities

6.1 High-brightness Warning LEDs

In specific applications (such as the emergency rescue of hazardous chemical accidents), the high-brightness warning LEDs of Sniffer4D Mini2 can warn onsite personnel or people in the surrounding environment to avoid secondary damage caused by toxic and harmful gases. The high-brightness warning LEDs have two working modes: Single Mode and Linear Mode.

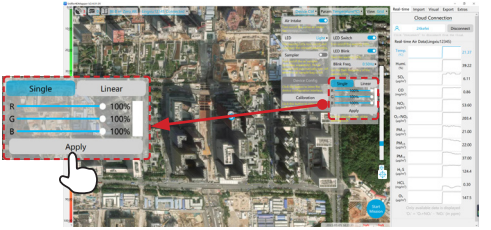
Single Mode

In single mode, you can specify the colour of the warning LEDs by setting different RGB (red, green and blue) values, and the colour will not change automatically. With Sniffer4D Mini2 on and communicating properly, you can turn on or off the high brightness warning LEDs through the "Device Control" drop-down menu of Sniffer4D Mapper, or by using DJI Pilot (through PSDK connection) to adjust to single mode.
Setting the Single Mode on Sniffer4D Mapper.

· Connect Sniffer4D Mini2 toSniffer4D Mapper software, and control the LED On/Off, Blink Freq., colours of the warning LEDs in the "Device Control" drop-down menu.

· By default, the blink frequency is 2.0Hz, which is to blink twice per second. You can select the desired blink frequency as needed.

· In single mode you can slide to adjust the RGB (red, green and blue) value to specify the colour of your Sniffer4D Mini2 warning LEDs.

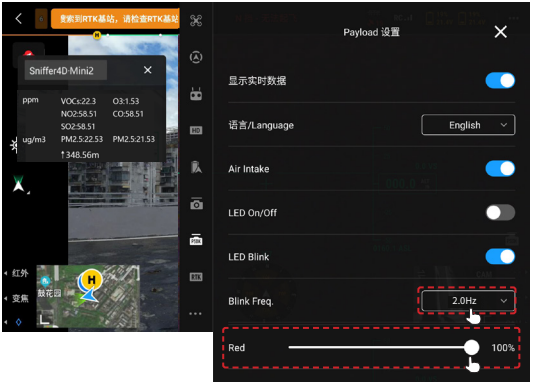


Setting the Single Mode on DJI Pilot

· When Sniffer4D Mini2 is integrated with the aircraft through PSDK connection, you can control LED On/Off, Blink Freq., colours of the warning LEDs through the "Payload Settings" on DJI Pilot.

· The warning LEDs setting on DJI Pilot is the same as that for the Sniffer4D Mapper. By default, the blink frequency is 2.0Hz, which is to blink twice per second. You can select the desired blink frequency as needed.

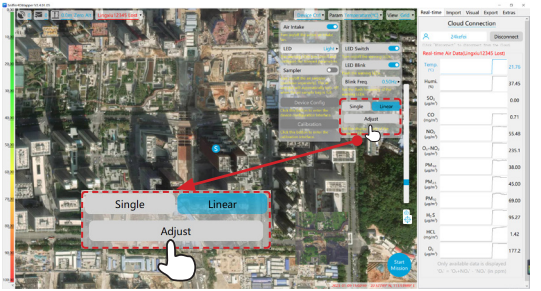
When the "Red" slider slides up to 100% as shown in the below pictures, the warning LEDs are red.



Linear Mode

In linear mode, the colour of the warning LEDs will automatically change with the gas concentration. The higher the concentration, the redder the warning LEDs are; while the lower the concentration, the greener the warning LEDs are. You can adjust the colour range of the upper limit (red) and lower limit (green) of each gas on Sniffer4D Mapper.

Select "Linear" on Sniffer4D Mapper, select "Adjust" in the setting window, and adjust the colour range in linear mode.

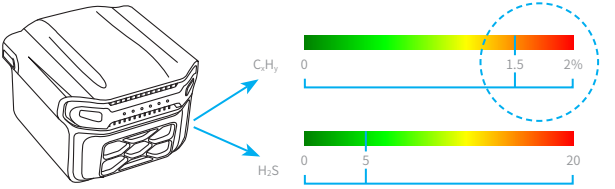


In the "LED Colour Range Setting" window, you can input the upper limit (red) and lower limit (green) values of the colour range for the monitoring gas as needed.

⚠ · The upper and lower limits of the colour range can only be adjusted through Sniffer4D Mapper.

· The working mode, colour range and other parameters of the high-brightness warning LEDs will be automatically saved in Sniffer4D Mini2, and there is no need to reset it at each start-up.

When Sniffer4D Mini2 monitors multiple gases, the colour of the warning LEDs will be determined by the gas concentration closest to the upper limit of the colour range (proportional) among all gases.
For example, a Sniffer4D Mini2 has CxHy and H2S sensing modules. The range of CxHy is set to 0~2%, and the range of H2S is set to 0~20ppm. If the current CxHy concentration is 1.5% and the current H2S concentration is 5ppm, CxHy is obviously closer to the upper limit of its range. In this case, the colour of the warning LEDs is determined by the CxHy sensing module as shown in the below figure.



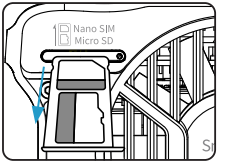
· By setting different warning LED colours using Sniffer4D Mapper, the onsite personnel from the front line can be informed of the current concentration of toxic and harmful gases at any time, and avoid secondary accidents to the furthest.

6.2 Real-time 4G Data Transmission Guidelines

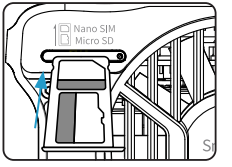
Sniffer4D has built-in LTE connectivity with no external antenna, supporting global 4G, 3G, EDGE, and GPRS network. A NanoSIM card needs to be provided by the user.

Users outside China mainland need to prepare a NanoSIM card with cellular data, and insert it into Sniffer4D Mini2 according to the direction shown next to the SIM card slot. Then follow the steps below to configure the APN (Access Point Name) for the SIM card.

- Gently push the MicroSD card once to remove it from Sniffer4D Mini2.
- Read the MicroSD card with a computer, and open the config.dat file on the SD card.using a text editor.
- Consult the local service provider of the SIM card for the APN settings, or search online for correct APN settings (e.g. https: //apn.how/).
- In the config.dat file, delete the existing APN information and type in the APN for the SIM card (e.g. the APN should be vodafone for Vodafone NZ).



Remove SD card with an ejection pin.



Insert with the front side upward

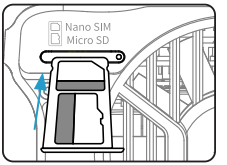
In the config.dat file, delete the existing APN information and type in the APN for the SIM card.

① APN=vodafone;

② After setting the APN, press "Ctrl+S" to save, or click File on the text editor and select Save;

③ Reinsert the MicroSD card back into Sniffer4D Mini2.

Save the config.dat file and insert the MicroSD card back into Sniffer4D according to the direction shown next to the SD card slot. Power up Sniffer4D Mini2 and wait for 30 seconds, the 4G status LED on the top should blink quickly, indicating that the data is being transmitted through 4G network. If the 4G status LED blinks slowly or is off, please check whether the APN setting is correct and whether the NanoSIM card is properly inserted.



When inserting the NanoSIM card, note that the side with the gap should face leftward and the side with the logo should face upward.

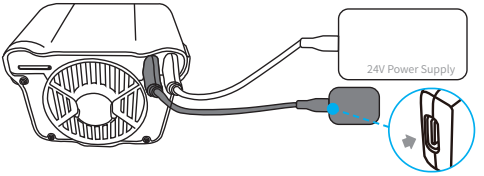
- Possible causes of unstable network connection include:
  ① The mobile signal is poor in the current location of Sniffer4D Mini2. In this case, you can move Sniffer4D Mini2 to an environment with a good signal for the test.
  ② The SIM card has no cellular data or it is not activated.
  ③ The APN of the SIM card is not set correctly (users outside China mainland).

6.3 Real-time Data Transmission via DCM Guidelines

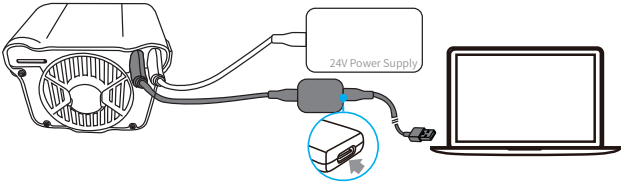
Connect to computer via cable and read the data on Sniffer4D Mapper

Please refer to the followings for connecting Sniffer4D Mini2 to computer via DCM.

1. Use the dual USB-C cable to connect one end of the DCM (Direct Connection Module) to Sniffer4D Mini2's Telem. Port.



2. Connect the other end of the DCM to a USB port on a computer.



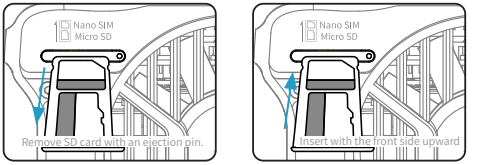
3. Power Sniffer4D Mini2 through the PSDK port at the back (24V Power Supply).

4. Open Sniffer4D Mapper, choose the right COM port for the DCM in "Real-time -Connect via USB", and click "Connect". Now，you should see the real-time measurement data of Sniffer4D Mini2 from the interface.

Real-time Data Transmission via USB Cable & Plaintext Data Output

If you need to output the real-time plaintext data of Sniffer4D Mini2 to other devices, e.g. Raspberry Pi or STM32 Microcontroller, you can refer to the method below. We need to configure Sniffer4D Mini2's data output to the plaintext data.

1. Remove the MicroSD card from the base unit, read the MicroSD card on a computer and open the config.dat, with a text editor. Modify "TelemOutputPlaintext" to "TelemOutputPlaintext=ture" for the for plaintext data output. Insert the MicroSD card back into Sniffer4D Mini2 according to the direction shown next to the SD card slot.



⚠ · When inserting the SD card, be sure to insert it according to the direction shown next to the SD card slot.

2. Open the config.dat file with a text editor, and the specific modifications are as follows:

config- 记事本
文件(F)　编辑 (E)　格式 (O)　查看 (V)　帮助 (H)

```
[Configuration]
APN=CMIOT
DJI_port_config=1
Ext_lstm_config=0
Ox_compensation_coefficient_for_SO2=-0.04
PumpOffManual=false
TelemOutputPlaintext=ture
fan=1
led_blue=100
led_green=100
led_mode=0
led_red=0
led_switch=1
pump=0
save_sd_plaintext_csv=0
vehicle_mode=0
wind_data_PSDK_compensation=1
```

① TelemOutputPlaintext=ture；

② After setting the configuration, press "Ctrl+S" to save, or click File on the text editor and select Save;

③ Reinsert the MicroSD card back into Sniffer4D Mini2.

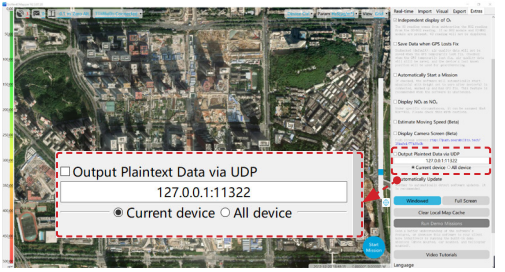
3. After restarting, Sniffer4D Mini2 will automatically output plaintext data through Telem. port (USB-C port). If you need to receive data through a serial port, you need to use a USB-to-serial module.
   You can simultaneously output plaintext data through Telem. port and output the encrypted data to Sniffer4D Mapper through 4G real-time data transmission.

· For the details of plaintext data, please refer to 6.5 Plaintext Output Content on P58.

6.4 Plaintext Output Through Sniffer4D Mapper (UDP)

When Sniffer4D Mapper receives the encrypted data from Sniffer4D Mini2, it supports decoding the encrypted data into plaintext data, and sending the data to a designated IP address through UDP.

With Sniffer4D Mini2 on and the 4G communication working properly, open Sniffer4D Mapper, click "Output Plaintext data via UDP" in "Extras" panel, and input the IP address and port number of the receiving end.



· For the details of plaintext data, please refer to 6.5 Plaintext Output Content on P58.

6.5 Plaintext Output Content

```
airData":{
CL2(ppm)":0,
CO(ppm)":0,
CO2(ppm)":0,
CxHy(%)":0,
H2(ppm)":0,
H2S(ppm)":0,
HCL(ppm)":0,
HCN(ppm)":0,
NH3(ppm)":0,
NO2(ppm)":0,
Ox(ppm)":0,
PH3(ppm)":0,
PM1.0(μg/m3)":0,
PM10(μg/m3)":0,
PM2.5(μg/m3)":0,
SO2(ppm)":0,
TSP(mg/m3)":0,
VOCs(ppm)":0,
[WR]SO2(ppm)":0
},
```

Gaseous/PM measurements
Only outputs available parameters.
Uninstalled parameters will not be included.
For example, if your Sniffer4D Mini2 only has PM module, then only PM1.0, PM2.5 and PM10 measurements will appear.

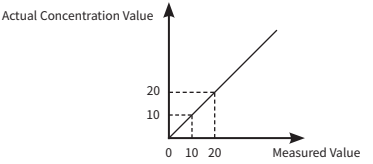
altitude":22.03436328125,	Relative Altitute (calculated using air pressure only, unit: m)
hdop":0,	GNSS Quality, lower is better
humidity":48.82352828979492,	Relative Humidity in %
latitude":21[redacted]	Latitude
longitude":21[redacted]	Longitude
pressure":99895.6171875,	Atmospheric Pressure (unit: Pa)
sateNum":0,	Number of GNSS satellite
sequence":426,	Data sequence, 1~65535, reset after around 18.2 hours
serial":"[redacted]",	Device Serial Number, consisting of 8 hexadecimals
temperature":28.823530197143555,	Temperature inside the sensing chamber (unit: ° C)
utcTime":"2020-06-05-02-01-17"	UTC time from the GNSS module. If outputted from Sniffer4D Mapper, PC time will be used when there is no GNSS reception

VII. Sniffer4D Mini2 Calibration

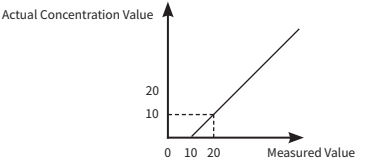
To ensure that Sniffer4D Mini2 accurately monitors target gases or particulate matters, we recommend calibrating the device every 12 months with reference equipment. If you have very strict requirements on data quality, you can perform calibration every six months or less. The specific calibration principles and operations are as follows. (You can calibrate the device yourself, or send it back to the manufacturer Soarability for calibration).

7.1 Calibration Principles

Ideally, the measured values of the device are consistent with the actual concentration values. The relationship is as follows:



However, in practice, the measured values may differ from the actual concentration values due to the limitations of the detection methods, the environmental differences (e.g. temperature, humidity, atmospheric pressure etc.), and the differences in local standards. Despite the factors mentioned above, the correlation between the values should be good (the trend matches). The figure below is an example:



By applying certain calibration parameters to the measured values, the calibrated measured values will be more consistent with the actual concentration values. This process is called calibration. As shown in the figures:

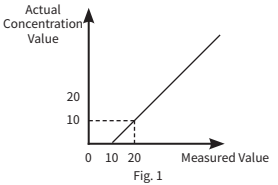


Fig. 1

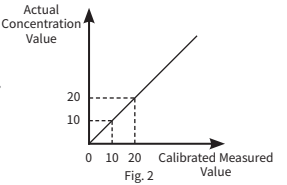


Fig. 2

In this device, the formula used for calibration is as follows:

Calibrated Measured Values=
Sensitivity Correction Factor × (Measured Values + Zero Offset)

Sensitivity correction factor and zero offset are the calibration parameters.
Sensitivity Correction Factor: the slope of the line in Figure 2 / the slope of the line in Figure 1. The default value is 1.

Zero Offset: In the case of the default sensitivity correction factor, the negative of the measured value when the actual concentration value is 0. The default value is 0.

Soarability have rigorously calibrated sensing modules (for specific ones only) before delivery (long-term data comparison method, see the calibration report that comes with the device), and have written the corresponding calibration parameters into the device.**However, due to the environmental differences, the differences in local standards, and the aging problem of the device, etc., there may be some deviation in the measured values.** If this happens, users can carefully adjust the calibration parameters by themselves.

The following sections will guide you through the steps to calculate the above calibration parameters and to write them into the device.

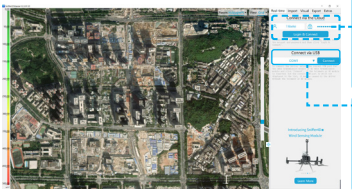
⚠ · **Please note that the incorrect calibration parameters can cause severe distortion of the data. Do not attempt to calibrate the device if you do not have a deep understanding of this chapter.**

7.2 Rough Calibration for Light Scattering (Inhalable PM or TSP) Modules

In the rough calibration for light scattering modules (e.g. internally-mounted PM/inhalable particulate matter module), we need to assume that only the sensitivity correction factors need to be calibrated but not the zero offsets. This calibration method is simple and fast with a good marginal effect.

Steps:

1. Place the device near the reference equipment (e.g. a standard monitoring station or other more accurate instruments), keep it at the same height as the reference equipment (the standard monitoring station), and turn on the device.
2. Connect the device to the analytical software Sniffer4D Mapper and click to enter the calibration interface.



Connection Method 1: You can log in to Sniffer4D Mapper when Sniffer4D Mini2 is on and 4G communication is working properly.

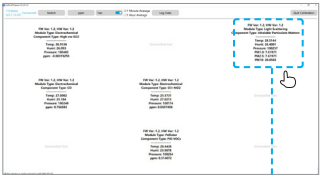
Connection Method 2: Connect Sniffer4D Mini2 to the PC using DCM, and connect Sniffer4D Mini2 to 5V / 3A power supply through the USB-C port.

· Be sure that the Mini2 is in a very similar environment to the reference equipment (with the same inhaled air). For example, Sniffer4D Mini2 is placed at the shoulder height of the roadside, while the reference equipment is located on the top of a building on the roadside. Despite that the physical distance between the two locations is close, there is a significant difference in the environment (the concentration of particulate matter on the roadside is usually higher than that in high places). In this case, the value from the reference equipment is not recommended for the calibration of Sniffer4D Mini2.

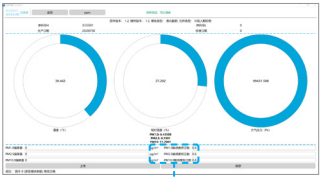
Click "Device Control" to show the drop-down menu.

Click "Calibration" to enter the calibration interface.

3. In the calibration interface, select the light scattering module (e.g. Inhalable PM or TSP) that you want to calibrate, and click the module to enter the module calibration interface.



Click the light scattering module that you want to calibrate



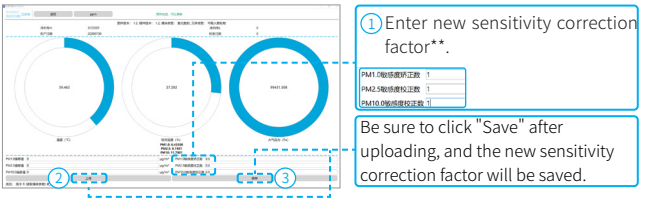
Value input box on the module calibration page

4. When the interface prompts "Preheating time is too short, calibration is not recommended", please wait until the module is fully warmed up and the value is completely stabilized.

5. Calculate the New Sensitivity Correction Factor:

$$\text{New Sensitivity Correction Factor} = \frac{\text{Reference Equipment Measured Value} \times \text{Current Sensitivity Correction Factor}^{*}}{\text{Device Measured Value}}$$

6. Use the measured value from the reference equipment to calculate the new sensitivity correction factor according to the formula mentioned above. Enter the calculated new sensitivity correction factor into the input box of the module calibration interface. Click "Upload" and "Save". (If only"Upload" is clicked but not"Save", the parameters you enter will return to their original values the next time you power on the device.)



* "Current sensitivity correction factor" is the current value of the sensitivity correction factor in the interface.
For example: the sensitivity correction factors of PM1.0/2.5/10.0 in the reference image are 0.6/0.6/0.8.

** This parameter can only be used as an example and can not be used as a refer ence value to calibrate your Sniffer4D Mini2.

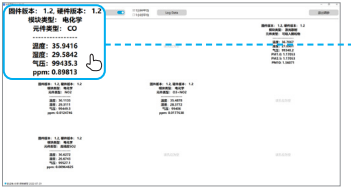
7.3 Rough Calibration for Non-Light Scattering Modules

In the rough calibration for non-light scattering modules, we need to assume that only the zero offsets need to be calibrated but not the sensitivity correction factors. This calibration method is simple and fast.

Steps:

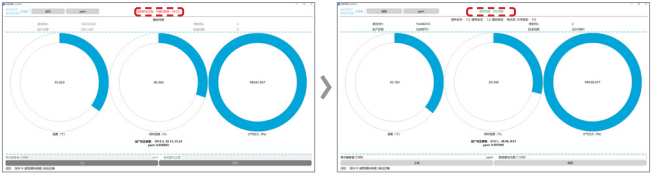
1. Connect and enter the calibration interface, you can refer to the steps from 7.2 Rough Calibration for Light Scattering (Inhalable PM or TSP) Modules on P61.

2. In the calibration interface, select the non-light scattering module (for example: CO, SO2, NO2, VOCs, O3+NO2, CxHy, H2S, HCl, H2, NH3, PH3, O2, Cl2) that you want to calibrate, and click the module to enter the module calibration interface.



Click the non-light scattering module that you want to calibrate

3. Since the required preheating time for is different each module, please wait until the module is fully warmed up and the value is completely stabilized before calibration.

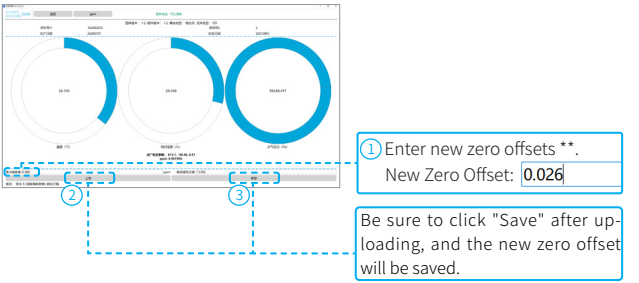


⚠ · The calibration can only be performed when Sniffer4D Mini2's temperature stabilizes. After calibration, the operating temperature should be kept within ±2° C varying from the calibration temperature for the best data quality.

4. Calculate the New Zero Offset:

$$\text{New Zero Offset} = \frac{\text{Reference Equipment Measured Value - Device Measured Value}}{\text{Current Sensitivity Correction Factor}} + \text{Current Zero Offset}^{*}$$

5. Use the measured value from the reference equipment to calculate the New Zero Offset according to the formula mentioned above.Enter the calculated new zero offset into the input box of the module calibration interface. Click "Upload" and "Save". (If only "Upload" is clicked but not "Save", the parameters you enter will return to their original values the next time you power on the device.)



* "Current Zero Offset" is the current value of the zero offset in the interface. For example: the current zero offset in the reference image is 0.000.

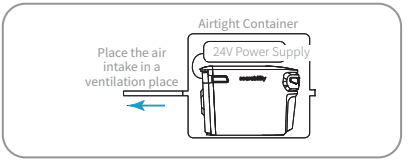
** This parameter can only be used as an example and can not be used as a reference value to calibrate your Sniffer4D Mini2.

7.4 Fine Calibration with Standard Gases

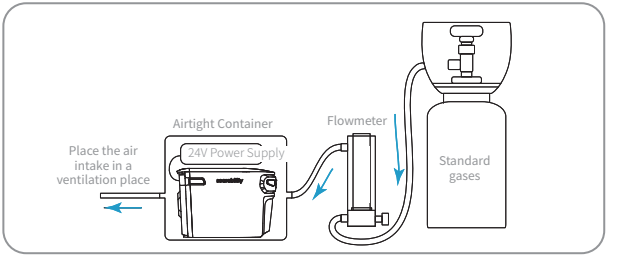
By using clean air and standard gases with known concentrations, you can calculate the sensitivity correction factors and zero offsets of sensing modules. This way of calibration is more accurate (provided that the standard gases have high quality). Before calibration, you must prepare a clean gas or a cylinder of the target gas with known concentration, a tube, a flow meter, a sealing cap and a power bank for Sniffer4D Mini2. You can either connect to your Sniffer4D Mini2 through DCM or through 4G communication.

Steps:

1. Place your Sniffer4D Mini2 in an airtight container as shown in the picture below.

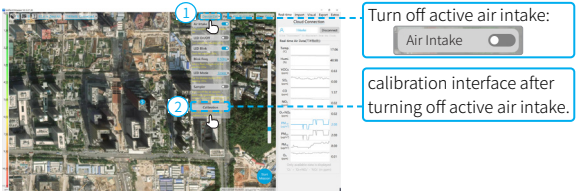


Connect Sniffer4D Mini2 to the cylinder with a tube, and make sure that the overall connection is airtight before calibration. If your cylinder can not control the gas flow, be sure to add a flow meter to the connection. If you would like to perform calibration using Internet connection, you must place Sniffer4D Mini2 in somewhere with good signal. The figure below shows the connection of standard gas calibration.



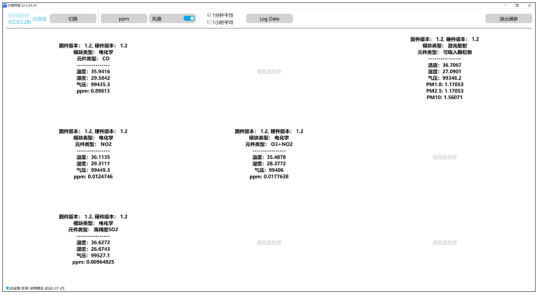
⚠
- Pay attention to the concentration and flow rate of the standard gases before calibration. For the calibration of some high-resolution modules, you should not use standard gases with high concentrations. In addition, you should keep Sniffer4D Mini2 airtight to avoid any gas leakages, and check whether the rubber ring is flattened when connecting to the sealing cap.
- Fine calibration using clean air or standard gases with known concentration requires certain specialized skills. If you can not complete the fine calibration or do not have the relevant equipment or accessories, it is recommended that you contact the sales support engineer for assistance or send it back to Soarability for calibration.
- Be sure to use a primary standard for calibration to acquire more accurate values for Sniffer4D Mini2.

2. Open Sniffer4D Mapper and log in, click "Device Control", and turn off "Air Intake" (turn off the fan at the rear of Sniffer4D Mini2), then click "Calibration" to enter the calibration interface.



⚠
- Be sure to turn off the active air intake fan during calibration to minimize the disturbance to the standard gases.

3. In the calibration interface, select the module that you want to calibrate, and click the module to enter the module calibration interface.

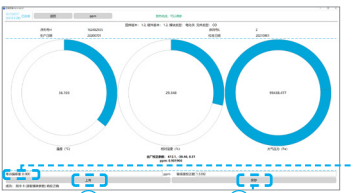


4. Inject clean air into Sniffer4D Mini2 at a flow rate of 1~3L/min. You can use a flow meter for the flow control.

5. Wait until the reading is stabilized and no longer drops (usually takes 1~10 minutes), calculate the new zero offset:
   New Zero Offset = Current Zero Offset* – Measured Value

   * "Current Zero Offset" is the current value of the zero offset in the interface.

6. Enter the calculated new zero offset into the input box of the module calibration interface. Click "Upload" and "Save". (If only "Upload" is clicked but not "Save", the parameters you entered will return to their original values the next time you power on the device.)



** This parameter can only be used as an example and can not be used as a reference value to calibrate your Sniffer4D Mini2.

7. Inject standard gas with known concentration into Sniffer4D Mini2 at a flow rate of 1~3L/min.
   Recommended Concentrations of Standard Gases:

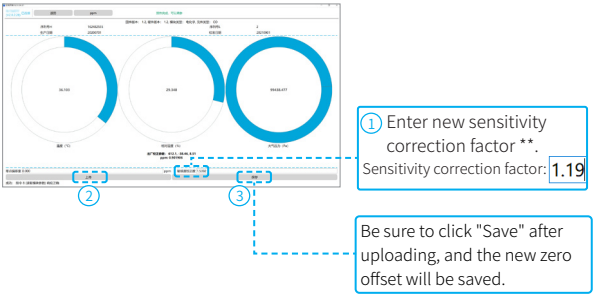
PM: 500~800μg/m³	CH4: 1~3%
TSP: 5mg/m³	VOC: 10~20ppm(isobutylene)
CO: 4~8ppm	H2S: 20~30ppm
O3: 4~8ppm	HCl: 20~30ppm
SO2: 4~8ppm	NH3: 50~70ppm
Wide-range SO2: 50~70ppm	NO2: 4~8ppm

8. Wait until the reading is stabilized and no longer rises (usually takes 1~10 minutes), calculate the new sensitivity correction factor:

$$\text{New Sensitivity Correction Factor} = \frac{\text{Standard Gas Concentration} \times \text{Current Sensitivity Correction Factor*}}{\text{Measured Value}}$$

* "Current sensitivity correction factor" is the current value of the sensitivity correction factor in the interface.

9. Enter the calculated new zero offset into the input box of the module calibration interface. Click "Upload" and "Save". (If only "Upload" is clicked but not "Save", the parameters you entered will return to their original values the next time you power on the device.)



** This parameter can only be used as an example and can not be used as a reference value to calibrate your Sniffer4D Mini2.

⚠ · When calibrating with flammable gases, keep away from sources of fire and static electricity.

⊘ · When calibrating with flammable gases, no fireworks are allowed.
· When calibrating with flammable gases, do not engage in operations that may produce sparks, such as using electronic equipment, striking iron, etc.

7.5 Fine Calibration using Long-term Comparison Data with Reference Equipment

1. Preparation before calibration

- Determine the reference equipment: Professional equipment from national monitoring station, academic super site, etc.
- Position: Place Sniffer4D Mini2 in the same environment as the reference equipment (the same height and the same direction for air intake) to maximize the accuracy.
- Restore default values: In the calibration interface, restore the calibration parameters of the target gases to default values (zero offset to 0 and sensitivity correction factor to 1). For some gases (CO, Ox, NO2, PID), you need to refer to the calibration report provided by Soarability for restoring the default values, and turn on "Air Intake" of Sniffer4D Mini2 on Sniffer4D Mapper - "Device Control" (on by default).

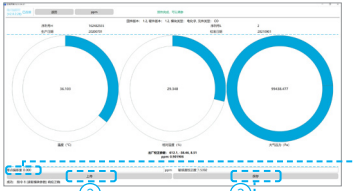
2. Collect data

- Sniffer4D Mini2 data collection: To record and export monitoring data to CSV with Sniffer4D Mapper, please refer to the content relevant to the "Export" panel (from the main interface) in chapter 5.4 on P37 (for other methods of data collection, e.g. SD card recording, connect a card reader to the computer to obtain monitoring data from the SD card), then process the data in the exported CSV file and select the value at the required time point.
- For data collection from the reference equipment, please contact relevant technical personnel.

3. Data processing

- Calibration principle: Linear fitting method is applied to enhance the data consistency between Sniffer4D Mini2 and the reference equipment.
  The reference equipment is represented as f(x), Sniffer4D Mini2 is represented as x, and the formula is f(x)=a(x+b);
- Data analysis: Use Excel or other scientific research software to fit the data.
- Note: The time stamp and time interval of Sniffer4D Mini2 and the reference equipment should be consistent (in case of inconsistency, the data need to be sorted out).
- Calculation of New zero offset: **New Zero offset = Zero Offset calculated by formula / Sensitivity Correction Factor**.

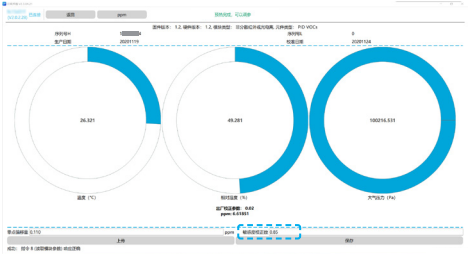
  The calculated new zero offset and sensitivity correction factor should be uploaded and saved to the calibration interface of Sniffer4D Mapper - "Device Control" - "Calibration", as shown in the figure:



* This parameter can only be used as an example and can not be used as a reference value to calibrate your Sniffer4D Mini2.

7.6 Configure PID VOCs Module According to Specific Target Gas

The default target gas of Sniffer4D Mini2 PID VOCs sensing module is isobutylene.
If you want to modify the target gas of the PID VOCs module, you need to adjust its sensitivity correction factor in the calibration interface of the PID VOCs module.



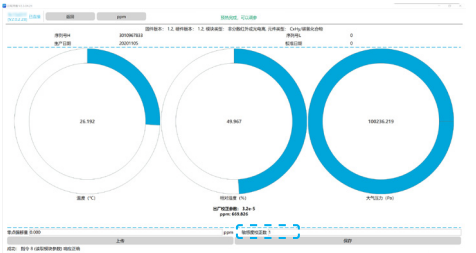
The corresponding sensitivity correction factors for specific VOC target gases can be found in Appendix VII on P71.

- Before modifying the parameters, you can back up the default sensitivity correction factor in case of further modification back to the default value.

- Wait until Sniffer4D Mini2's temperature stabilizes before calibration, the variation between the operating temperature and the calibrating temperature should be within ±2 ° C for the best data quality.

7.7 Configure NDIR CxHy Module According to Specific Target Gas

The default target gas of Sniffer4D Mini2 NDIR CxHy sensing module is methane.
If you want to modify the target gas of the NDIR CxHy module, you need to adjust its sensitivity correction factor in the calibration interface of the NDIR CxHy module.



The corresponding sensitivity correction factors for specific NDIR CxHy target gases can be found in Appendix VII on P72.

- Before modifying the parameters, you can back up the default sensitivity correction factor in case of the future modification back to the default value.
- Wait until Sniffer4D Mini2's temperature stabilizes before calibration, the variation between the operating temperature and the calibrating temperature should be within ±2° C for the best data quality.

VIII. Operational Practice Guidelines

8.1 Achieving Better Data Quality

1. Ensure appropriate operating temperature of Sniffer4D Mini2

The electrochemical sensors inside Sniffer4D Mini2 are sensitive to temperature, and even tiny changes in the temperature may cause significant a variation in the output signal. Soarability's proprietary algorithms for Sniffer4D Mini2 can mitigate and compensate for some of the effect caused by temperature changes, but the effect cannot be eliminated completely. For the best data quality, please make sure that the operating temperature of Sniffer4D Mini2 is within an appropriate range.

- The appropriate operating temperature ranges from 20° C~27° C, and the optimal operating temperature ranges from 20° C~25° C. You should refer to the temperature displayed on the main interface of Sniffer4D Mapper. Since the electronic components inside Sniffer4D Mini2 will generate heat during operation, the actual internal temperature is slightly higher than the external ambient temperature.
- Try to avoid temperature ramps or jumps even in an appropriate operating temperature range, in case of the effect from the zero drift of the sensors.
- Try to avoid a deviation of < ±1.5° between the calibrating temperature and operating temperature, or Sniffer4D Mini2's performance during operation may differ from that during the calibration.
- The electrochemical sensing module is affected by temperature the most, followed by the NDIR method, and the least affected for the PID and light scattering methods.

2. Ensure appropriate operating humidity of Sniffer4D Mini2

Humidity has a certain effect on the PID and light scattering sensors inside Sniffer4D Mini2. Soarability's proprietary algorithms for Sniffer4D Mini2 can mitigate and compensate for some of the effect caused by the humidity changes, but the effect cannot be eliminated completely. For the best data quality, please make sure that the operating humidity of Sniffer4D Mini2 is within an appropriate range.

- The appropriate operating humidity ranges from 15~80%RH, and the optimal operating temperature ranges from 25~60%RH.
- Try to avoid humidity ramps or jumps even in an appropriate operating humidity range, in case of violent value fluctuations of the electrochemical sensors. When there are dramatic changes in the humidity (e.g. moving Sniffer4D Mini2 from an air-conditioned room to the outdoors), the electrochemical sensors require 3-5 min to achieve a new chemical balance.

- Try to avoid a deviation of ＜ ±20%RH between the calibrating humidity and operating humidity, or Sniffer4D Mini2's performance during operation may differ from that during the calibration.
- In environments with mist, light scattering sensors may identify parts of the mist as solid particulate matter, resulting in high-concentration PM values.

3. Ensure stable atmospheric pressure

Changes in atmospheric pressure have a certain impact on the sensors inside Sniffer4D Mini2, which may lead to a decrease in the data quality.

Therefore, we should try to avoid atmospheric pressure changes on Sniffer4D Mini2 for the best data quality.

- When using an external pump, try to avoid clogging the air path (e.g. covering the air intake by hand).
- When using an aircraft, keep the speed changes within 0.8m/s to avoid abrupt changes in atmospheric pressure caused by excessive climb rate.
- When using an external pump, the air pump should be at the rear end of the air path, i.e. "pumping".

4. Avoid vibration

Vibration has a certain impact on the sensors inside Sniffer4D Mini2, which may lead to a decrease in the data quality. Sniffer4D Mini2 has the internal vibration reduction mechanism, which can effectively mitigate some high-frequency vibrations. In this case, please try to avoid the vibration of Sniffer4D Mini2 during use.

- When using with ground vehicles, gently close the door and slow down when crossing a pit
- When using with aircrafts, land slowly.

8.2 Cross-sensitivity

During gas detection missions, please pay special attention to the cross-sensitivity phenomenon. Some electrochemical sensing modules do have cross-sensitivity. Common cross-sensitivity cases are:

- O3+NO2 and NO2 modules are negatively cross-sensitive with H2S gas; when the concentration of H2S in the environment is high, the values of O3+NO2 and NO2 modules decrease rapidly; when H2S is gone, the values of O3+NO2 and NO2 modules return to normal.
- O3+NO2 and NO2 modules are positively cross-sensitive with Cl2 gas; when the con centration of Cl2 in the environment is high, the values of O3+NO2 and NO2 modules increase rapidly; when Cl2 is gone, the values of O3+NO2 and NO2 modules return to normal.

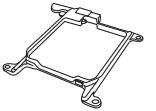
Please contact us if you want to know more about which gases in the environment are cross-sensitive with the sensing modules.

Appendix 1: Product Packing List

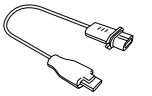
Standard Package

Sniffer4D Mini2 Device x 1

M30 Quick Mounting Bracket x 1



M30 PSDK Cable x 1



16GB MicroSD Card x 1

M3*6 Screw x 5

Cross Screwdriver x 1

Ejection Pin x 1

Carrying Case x 1

User Manual

Calibration Report (for specific sensing modules only)

* Sniffer4D Mini2 only supports NanoSIM cards, and a 16GB MicroSD card has been inserted in the SD card slot by default. No SIM card provided.

** Pre-and post-calibration reports are provided based on the specific sensing modules you choose.

Appendix II: Product Specifications

Sniffer4D Mini2 Specifications

Component name	Functionalities & Specs		Remarks
Sniffer4D Mini2 Base Unit	Size	Ultra compact & lightweight structural design: 102*103*72mm	* No SIM card provided. For GPRS/EDGE/3G/4G real-time data transmission, please prepare a SIM card with cellular data yourself and set the proper APN in the Config file of the SD card. * Equipped with a 16GB MicroSD card.
	Weight	<300g	
	Water proof	IPX2	
	Structure	Injection molding with strong engineering plastic.	
	Available Parameters	Sense up to 9 gases at time, Available Parameters include: PM2.5, PM10, SO2, NO2, O3, CO, VOCs, CxHy/CH4/LEL, H2S, O2, NH3, HCl, HCN, HF, H2, Cl2, PH3, NO, CO2, OU (Odor)	
	Active air intake system	With the active air intake system, the air intake volume is approx. 5L/min flow rate when subject to zero additional resistance. The active air intake can be easily connected to a tube with an inner diameter of 6~10mm. When connecting to a sealing cap, the air outlet can connect to a tube with an inner diameter of 4~8mm.	
	Power supply	DJI M30 PSDK Power Port (Specific power cable required).	
	ARM CPU	32 位 1GHz ARM CPU and 512MB RAM.	
	Status LEDs	6 LEDs indicating Sniffer4D Mini2's working status: sensor assembly, GNSS, SD card, LTE, aircraft communication, and external device.	
	Built-in 4G	Built-in LTE connectivity with no external antenna. Support global 4G, 3G, EDGE, and GPRS network. A NanoSIM card needs to be provided by the user.	
	PSDK	Fully support DJI Payload SDK (PSDK) . The user can view Sniffer4D's real-time data or control Sniffer4D using DJI Pilot App running on the DJI remote controller.	

Component name	Functionalities & Specs		Remarks
Sniffer4D Mini2 Base Unit	Plaintex data output	· Real-time encrypted data transmission (1Hz) with data retrieval algorithm. The data retrieval function allows storing up to 9h of data when communication is lost, and the data can be automatically retrieved after the communication is reconnected. · Encrypted data output port (USB Type-C), allowing data transmission in user-specified communication channels (e.g. a private LTE network). · Plaintext data output port (USB Type-C), enabling easy communication with other devices (e.g. a flight controller) for secondary development. · Sniffer4D Mini2 supports real-time data forwarding to user-specified software platforms using MQTT protocol. (4G internet connection required, please consult Soarability sales support engineer for more details.)	* No SIM card provided. For GPRS/ EDGE/3G/4G real-time data transmission, please prepare a SIM card with cellular data yourself and set the proper APN in the Config file of the SD card. * Equipped with a 16GB MicroSD card.
	Warning LEDs	· Four high-brightness RGB warning LEDs can be configured solid or blink. (Blink frequency adjustable). · The LEDs can be configured to automatically vary their colour according to the gas/PM concentrations.	
	Swarm operation	Swarm supported. One or multiple Sniffer4Ds can communicated with one or multiple PCs.	
	SD card	Support mission data backup with Sniffer4D's built-in SD card module, and the stored mission data can be read and analyzed in Sniffer4D Mapper.	
	OTA firmware upgrade	Support Over-the Air (OTA) firmware update.	

Sniffer4D Mapper Specification

Component name	Functionalities & Specs		Remarks
Sniffer4D Mapper Data visualization and analysis software	Real-time data	· Display real-time working status of Sniffer4D, including device name, GNSS satellite number, relative altitude, volume of data to be retrieved. Control Sniffer4D Mini2's high-brightness warning LEDs, gas sampling module, and other functionalities. Retrieve unreceived data during communication breakdown. · Display real-time measurement values and their time series graphs. Generate real-time 2D grid gas/PM concentration heat map. · Generate real-time 2D isoline gas/PM concentration heat map. · Generate real-time 3D point cloud gas/PM concentration heat map.	· Require 64-bit Windows10 operating system. Optional functions can be activated after purchase
	Video streaming	Display real-time aircraft camera view and save geo-tagged screenshots ("Video Streaming Service" needs to be selected).	
	Real-time estimation of FSC	Estimate Fuel Sulfur Content (FSC) using proprietary inversion algorithm. (cost separately)	
	Import data files	Support loading multiple historical data files into the software for post analysis.	
	Import Orthophoto	Support loading an orthophoto (GeoTiff, WGS84) and displaying it under the concentration heat maps. Live orthomaps are updated in real time.	
	Import geo-tagged photos	Support loading geo-tagged photos and showing their locations in the concentration heat map.	
	PDF mission report	Support automatic PDF mission report generation.	
	CSV datasheets	Support exporting mission files as a CSV datasheet.	
	One-to-multiple ends	Track and display multiple Sniffer4Ds simultaneously.	
	Module calibration	Display the detailed working status of internally-mounted sensing modules inside the Sniffer4D. The user can calibrate the sensitivity (slope) and zero point (intercept) of each module.	
	UDP data output	Output decoded Sniffer4D data (json) using UDP.	
	Software upgrade	Unlimited software installations and automatic software updates.	

Appendix III: Optional Internally-mounted Sensing Modules

Up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application

Inhalable Particulate Matter (PM2.5&10) Sensing Module

Component name	Functionalities & Specs		Remarks
Inhalable particulate matter sensing module Up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Laser scattering / light scattering	· For general environmental monitoring.
	Particle size range	Sense PM1.0 (particle size 0.3~1um), PM2.5 (particle size 0.3~2.5um), and PM10 (particle size 0.3~10um).	
	Particle counting effectiveness	50%@0.3μm，98%@>0.5μm	
	Range	0~1000μg/m3	
	Detection limit	1μg/m3	
	Repeatability	<2%FS	
	Theoretical resolution	1μg/m3	
	Warm-up time from a cold start	<10s	
	Overall response time	<10s	
	Est. service life	36 months	
	Humidity correction	On-chip proprietary humidity correction algorithm, enabling better data quality in wide humidity range.	

High-resolution O3+NO2 Sensing Module

Component name	Functionalities & Specs		Remarks
High-resolution O3+NO2 sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For general environmental monitoring. Individual O3 concentration is calculated using: O3=(O3+NO2) -NO2
	Sensitivity	Sensitive to both O3 and NO2, but unable to identify individual concentrations.	
	Range	0~11ppm	
	Detection limit	<4%FS	
	Overall response time (t90)	<45s（0~1ppm）	
	Theoretical resolution	<1ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges.	
	Dormant Mode	Support "Dormant Mode", warm-up time from a cold start: < 5s	
	Sensitivity drift	-20~-40%/year ((in laboratory environment)	
	Zero drift	0~20ppb/year ((in laboratory environment)	
	Est. service life	24 months	
	Operating temperature	-30~40°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-85%RH	

High-resolution NO2 Sensing Module

Component name	Functionalities & Specs		Remarks
High-resolution NO2 Sensing Module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For general environmental monitoring, HAZMAT response, and ship fuel sulfur content monitoring
	Range	0~11ppm	
	Detection limit	5ppb	
	Repeatability	<4%FS	
	Overall response time (t90)	<60s（0~2ppm）	
	Theoretical resolution	<1.1ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the NO2 module.	
	Dormant Mode	Support "Dormant Mode", warm-up time from a cold start: < 5s	
	Sensitivity drift	-20~-40%/year (in laboratory environment)	
	Zero drift	0~20ppb/ year (in laboratory environment)	
	Operating temperature	-30~40°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-85%RH	

High-resolution CO Sensing Module

Component name	Functionalities & Specs		Remarks
High-resolution CO Sensing Module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For general Environmental monitoring and HAZMAT response.
	Range	0~11ppm	
	Detection limit	4ppb	
	Repeatability	<4%FS	
	Overall response time (t90)	<20s（0~10ppm）	
	Theoretical resolution	<0.6ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the CO module.	
	Dormant Mode	Support "Dormant Mode", warm-up time from a cold start: < 5s	
	Sensitivity drift	<10%/year (in laboratory environment)	
	Zero drift	<±100ppb/year (in laboratory environment))	
	Est. service life	36 months	
	Operating temperature	-30~50℃ (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

High-resolution SO2 Sensing Module

Component name	Functionalities & Specs		Remarks
High-resolution SO2 sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For general environmental monitoring and HAZMAT response.
	Range	0~15ppm	
	Detection limit	5ppb	
	Repeatability	<4%FS	
	Overall response time (t90)	<40s（0~2ppm）	
	Theoretical resolution	<0.8ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the SO2 module.	
	Dormant Mode	Support "Dormant Mode", warm-up time from a cold start: < 10s.	
	Sensitivity drift	<±15%/ year (in laboratory environment)	
	Zero drift	<±20ppb/year (in laboratory environment)	
	Est. service life	36 months	
	Operating temperature	-30~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

High-resolution NO Sensing Module

Component name	Functionalities & Specs		Remarks
High-resolution NO sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For general environmental monitoring and HAZMAT response.
	Range	0~11ppm	
	Detection limit	5ppb	
	Repeatability	<4%FS	
	Overall response time (t90)	<20s（0~10ppm）	
	Theoretical resolution	<1.1ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the NO module.	
	Dormant Mode	Support "Dormant Mode", warm-up time from a cold start: < 5s.	
	Sensitivity drift	-20~-40%/ year (in laboratory environment)	
	Zero drift	0~20ppb/ year (in laboratory environment)	
	Est. service life	24 months	
	Operating temperature	-30~40°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-85%RH	

Wide-range VOCs Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range VOCs sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Photoionization detection (PID)	· For general environmental monitoring, odor detection, oil & gas leak detection, and HAZMAT response. · For details, please refer to PID VOCs Module Target Gases and Corresponding Sensitivity Correction Factors
	Target gas	Volatile organic compounds (VOCs) with ionization potential energies <10.6eV.	
	Range	0~50ppm (isobutylene)	
	Detection limit	1ppb	
	Repeatability	<4%FS	
	Overall response time (t90)	<3s (diffusion mode)	
	Theoretical resolution	3.8ppb	
	Data processing chip	On-chip proprietary individual difference compensation algorithms. It can also save the calibration parameters, production date and other information of the VOCs module.	
	Warm-up time from cold start	about 5min ("Dormant mode" not supported .)	
	Est. service life	5000 working hours	
	Operating temperature	-40~55°C	
	Operating humidity	Humidity at 0-75%RH has little effect on the data.	
	Default target gas	The default target gas is isobutylene. To measure other types of VOC, users need to adjust the sensitivity correction factor of the module.	

Wide-range H2S Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range H2S sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit.	Detection method	Electrochemistry	· For general environmental monitoring, odor detection, oil & gas leak detection, and HAZMAT response. · Due to cross-sensitivity, the high concentration of H2S will significantly affect the values of the NO2 and Ox modules.
	Range	0~90ppm	
	Detection limit	20ppb	
	Repeatability	<4%FS	
	Overall response time (t90)	<55s（0~2ppm）	
	Theoretical resolution	<3.7ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the H2S module.	
	Dormant mode	Support "Dormant Mode", warm-up time from a cold start: <10s	
	Sensitivity drift	<20%/year (in laboratory environment)	
	Zero drift	<±100ppb/year (in laboratory environment)	
	Est. service life	24 months	
	Operating temperature	-30~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

Wide-range CxHy/CH4/LEL Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range CxHy/CH4/ / LEL sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Non-dispersive infrared (NDIR)	· For oil & gas leak detection, and HAZMAT response.
	Target gases	hydrocarbons (flammable gases)	
	Range	0~5%VOL (0~100%LEL) methane, or 0~2% propane	
	Detection limit	0.01%	
	Repeatability	<2%FS	
	Accuracy	±10%	
	Overall response time (t90)	<30s	
	Theoretical resolution	0.01%/100ppm	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the CxHy/CH4/ / LEL module.	
	Warm-up time from a cold start	about 45s ("Dormant Mode" not supported.)	
	Zero drift	<±0.05% VOL/month	
	Est. service life	5 years	
	Operating temperature	-20~50℃	
	Operating humidity	0-95%RH	
	Default target gases	The default target gas is methane (CH4). To measure other types of alkanes, users need to adjust the sensitivity correction factor of the module.	

Wide-range CO2 Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range CO2 sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Non-dispersive infrared (NDIR)	For HAZMAT response.
	Range	0~5%VOL	
	Detection limit	0.01%	
	Repeatability	<2%FS	
	Accuracy	±10%	
	Overall response time (t90)	<30s	
	Theoretical resolution	0.01%/100ppm	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the CO2 module.	
	Warm-up time from a cold start	About 45s	
	Zero drift	<±0.05% VOL/month	
	Est. service life	5 years	
	Operating temperature	-20~50°C	
	Operating humidity	0-95%RH	

Wide-range NH3 Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range NH3 sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For odor detection and HAZMAT response.
	Range	0~100ppm	
	Detection limit	1ppm	
	Repeatability	<25%FS	
	Accuracy	±10%	
	Overall response time (t90)	<50s（0~50ppm）	
	Theoretical resolution	<0.2ppm	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the NH3 module.	
	Dormant mode	Support "Dormant Mode", warm-up time from a cold start: < 30s.	
	Zero drift	<±2ppm/year ((in laboratory environment)	
	Sensitivity drift	<3%/ year ((in laboratory environment)	
	Est. service life	24 months	
	Operating temperature	-30~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

Wide-range HCl Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range HCl sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For oil & gas leak detection and HAZMAT response.
	Range	0~100ppm	
	Detection limit	1ppm	
	Repeatability	<4%FS	
	Accuracy	±10%	
	Overall response time (t90)	<200s（0~25ppm）	
	Theoretical resolution	15ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the HCl module.	
	Dormant mode	Support "Dormant Mode", warm-up time from a cold start: < 30s.	
	Est. service life	24 months	
	Operating temperature	-30~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

Wide-range HCN Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range HCN sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For HAZMAT response.
	Range	0~100ppm	
	Detection limit	50ppm	
	Repeatability	<5%FS	
	Overall response time (t90)	<120s（0~30ppm）	
	Theoretical resolution	<0.05ppm	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the HCN module.	
	Dormant mode	Support "Dormant Mode", warm-up time from a cold start: < 30s.	
	Est. service life	12 months	
	Operating temperature	-30~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

Wide-range HF Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range HF sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	
	Range	0~100ppm	
	Detection limit	1ppm	
	Repeatability	<4%FS	
	Overall response time (t90)	<200s（0~25ppm）	
	Theoretical resolution	15ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the HF module.	
	Dormant mode	Support "Dormant Mode", warm-up time from a cold start: < 30s.	
	Est. service life	24 months	
	Operating temperature	-30~50℃ (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

Wide-range CO Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range CO sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	
	Range	0~1000ppm	
	Detection limit	70ppb	
	Repeatability	<4%FS	
	Overall response time (t90)	<20s（0~10ppm）	
	Theoretical resolution	<0.6ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the CO module.	
	Dormant mode	support "Dormant Mode", warm-up time from a cold start: < 5s.	
	Sensitivity drift	<10%/ year ((in laboratory environment.)	
	Zero drift	<±100ppb/year ((in laboratory environment.)	
	Est. service life	36 months	
	Operating temperature	-30~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

Wide-range OU Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range OU sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For odor detection.
	Range	0~10ppm	
	Detection limit	0.1ppm	
	Repeatability	<5%FS	
	Overall response time (t90)	<30s（0~10ppm）	
	Theoretical resolution	0.01ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the OU module.	
	Dormant mode	support "Dormant Mode", warm-up time from a cold start: <60s.	
	Est. service life	36 months	
	Operating temperature	-40°C ~+55°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-95%RH (non-condensing)	

Wide-range O2 Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range O2 sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For HAZMAT response.
	Range	0~50%	
	Detection limit	0.5%	
	Resolution	0.1%	
	Overall response time (t90)	<200s (0~25ppm)	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the O2 module.	
	Warm-up time from a cold start	about 60s (does not support "Dormant" mode.	
	Est. service life	24 months	
	Operating temperature	-30~55℃ (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	5~95%RH	
	Operating pressure	80-120kPa	

Wide-range SO2 Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range SO2 sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For HAZMAT response, and ship fuel sulfur content monitoring
	Range	0~100ppm	
	Detection limit	750ppb	
	Repeatability	<4%FS	
	Overall response time (t90)	<40s（0~2ppm）	
	Theoretical resolution	<8ppb	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the SO2 module.	
	Dormant mode	Support "Dormant Mode", warm-up time from a cold start: <10s.	
	Sensitivity drift	<±15%/year ((in laboratory environment)	
	Zero drift	<±20ppb/year ((in laboratory environment)	
	Est. service life	36 months	
	Operating temperature	-30~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

Wide-range H2 Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range H2 sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For H2 leakage monitoring in power station accidents.
	Range	0~5000ppm	
	Detection limit	17ppm	
	Repeatability	<5%FS	
	Overall response time (t90)	<55s（0~400ppm）	
	Theoretical resolution	<0.7ppm	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the H2 module.	
	Dormant mode	support "Dormant Mode", warm-up time from a cold start: <10s.	
	Zero drift	<±20ppb/ year ((in laboratory environment)	
	Est. service life	24months	
	Operating temperature	-30~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

Cl2 Sensing Module

Component name	Functionalities & Specs		Remarks
Cl2 sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· For HAZMAT response.
	Range	0~20ppm	
	Detection limit	0.5ppm	
	Repeatability	<4%FS	
	Overall response time (t90)	<60s（0~10ppm）	
	Theoretical resolution	<10ppb	
	Compensation algorithm	On-chip proprietary individual difference compensation algorithms.	
	Dormant mode	ssupport "Dormant Mode", warm-up time from a cold start: ⩽ 30s.	
	Est. service life	24months	
	Operating temperature	-20~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	15-90%RH	

Wide-range PH3 Sensing Module

Component name	Functionalities & Specs		Remarks
Wide-range PH3 sensing module Installed inside Sniffer4D Mini2, up to 8 internal modules can be installed inside a Sniffer4D Mini2 base unit. Choose the modules that fit your application.	Detection method	Electrochemistry	· Commonly used to check the phosphine gas emitted in the process of drug production.
	Range	0~2000ppm	
	Detection limit	20ppm	
	Repeatability	<5%FS	
	Overall response time (t90)	<30s（0~800ppm）	
	Theoretical resolution	<0.15ppm	
	Compensation algorithm	On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges. It can also save the calibration parameters, production date and other information of the PH3 module.	
	Dormant mode	support "Dormant Mode", warm-up time from a cold start: <30s.	
	Sensitivity drift	<1.5ppm/ year (in laboratory environment)	
	Zero drift	<4%/year (in laboratory environment)	
	Est. service life	24months	
	Operating temperature	-20~50°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.)	
	Operating humidity	20-90%RH	

Appendix IV: Warranty and After-sales Service

After-sales Service

Service item	Scope of service	Remarks
Free warranty service for non-human damages in the first year	· We provide a 1-year limited warranty for each order. During the warranty period, we will repair the unit for free if it's not damaged by human error. · Man-made damage includes, but is not limited to: damage caused by dropping, water permeating, etc.	
User training	During warranty period, remote training & technical support are provided via phone and video conferencing.	
Remote Training & Technical Support	During warranty period, remote training & technical support are provided via phone and video conferencing.	
Warranty Extension	· Extend the default warranty to another 1-2 years and the extension depends on individual cases. · In principle, warranty extension needs to be purchased together with the product.	
Paid Repair Service	· Paid repair is provided for man-made damages. · You could send the broken product back to the manufacturer (Soarability) for paid repair, or you could also ask the manufacturer (Soarability) to provide onsite repair at additional cost.	

Data connection service

Component name	Functionalities & Specs		Remarks
Data connection service	Cloud Data Connection Service	· Provide real-time internet data transmission between Sniffer4D Mini2 and Sniffer4D Mapper software. · Encrypted data transmission.	
	Video Streaming Service	· Stream live camera view (720p/1080p) remotely to Sniffer4D Mapper. · Encrypted data transmission.	
	Plaintext Data Forwarding Service	Forward the decoded real-time measurement data (json) from Sniffer4D Mini2 to a user-specified IP address using TCP/UDP.	

Product Customization

Custom items	Functionalities & Specs	Remarks
Sniffer4D Mini2 Base Unit Surface Logo Customization	· Customize laser-engraved logo on the top surface of Sniffer4D Mini2. · Details about the manufacturer and the product (laser-engraved on the bottom of Sniffer4D Mini2) may not be able to be modified due to compliance requirements.	
Software Logo Customization	· Customized logo at the bottom right corner of Sniffer4D Mapper. · Customized name for Sniffer4D Mapper. · Customized icon for Sniffer4D Mapper.	
Deep Customization	· Customized internally mounted or externally-mounted modules. · Customized software functionalities. · Customized appearance & structural design.	

Appendix V: PID VOCs Module Target Gases and Corresponding Sensitivity Correction Factors

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
1	Acetaldehyde	C_2H_4O	4.86
2	Acetic Acid	$C_2H_4O_2$	36.15
3	Acetone	C_3H_6O	0.71
4	Acrolein	C_3H_4O	4
5	Acrylic Acid	$C_3H_4O_2$	2.74
6	Allyl alcohol	C_3H_6O	2.07
7	Allyl chloride	C_3H_5Cl	4.5
8	Ammonia	NH_3	8.49
9	Amyl acetate, n-	$C_7H_{14}O_2$	1.8
10	Amyl alcohol	$C_5H_{12}O$	3.2
11	Aniline	C_6H_7N	0.5
12	Anisole	C_7H_8O	0.47
13	Asphalt, petroleum fumes		1
14	Benzaldehyde	C_7H_6O	0.86
15	Benzene	C_6H_6	0.5
16	Benzenethiol	C_6H_5SH	0.7
17	Benzonitrile	C_7H_5N	0.7
18	Benzyl alcohol	C_7H_8O	1.25
19	Benzyl chloride	C_7H_7Cl	0.55
20	Benzyl formate	$C_8H_8O_2$	0.77
21	Biphenyl	$C_{12}H_{10}$	0.4
22	Bis(2, 3-epoxypropyl) ether	$C_6H_{10}O_3$	3

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
23	Bromobenzene	C_6H_5Br	0.7
24	Bromoethane	C_2H_5Br	5
25	Bromoethyl methyl ether, 2-	C_3H_7OBr	2.5
26	Bromoform	$CHBr_3$	2.8
27	Bromopropane, 1-	C_3H_7Br	1.3
28	Butadiene	C_4H_6	0.83
29	Butadiene diepoxide, 1, 3-	$C_4H_6O_2$	4
30	Butane, n-	C_4H_{10}	46.29
31	Butanol, 1-	$C_4H_{10}O$	4.01
32	Butene, 1-	C_4H_8O	1.15
33	Butene, 1-	C_4H_8	1
34	Butoxyethanol, 2-	$C_6H_{14}O_2$	1.1
35	Butyl acetate, n-	$C_6H_{12}O_2$	2.42
36	Butyl acrylate, n-	$C_7H_{12}O_2$	1.5
37	Butyl mercaptan	$C_4H_{10}S$	0.54
38	Butylamine, 2-	$C_4H_{11}N$	0.9
39	Butylamine, n-	$C_4H_{11}N$	1
40	Camphene	$C_{10}H_{16}$	0.45
41	Carbon disulfide	CS_2	1.4
42	Carbon tetrabromide	CBr_4	3
43	Chlorine dioxide	ClO_2	1
44	Chloro-1, 3-butadiene, 2-	C_4H_5Cl	3.2
45	Chlorobenzene	C_6H_5Cl	0.45

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
46	Chloroethanol 2-	C_2H_5ClO	10
47	Chloroethyl methyl ether, 2-	C_3H_7ClO	2.6
48	Chlorotoluene, o-	C_7H_7Cl	0.45
49	Chlorotoluene, p-	C_7H_7Cl	0.5
50	Chlorotrifluoroethylene	C_2ClF_3	1
51	Cresol, m-	C_7H_8O	1.05
52	Cresol, o-	C_7H_8O	1.05
53	Cresol, p-	C_7H_8O	1.05
54	Crotonaldehyde	C_4H_6O	1
55	Cumene	C_9H_{12}	0.58
56	Cyclohexane	C_6H_{12}	1.16
57	Cyclohexanol	$C_6H_{12}O$	2.9
58	Cyclohexanone	$C_6H_{10}O$	1.03
59	Cyclohexene	C_6H_{10}	0.75
60	Cyclohexylamine	$C_6H_{13}N$	0.98
61	Cyclopentane	C_5H_{10}	4
62	Decane, n-	$C_{10}H_{22}$	1.04
63	Diacetone alcohol	$C_6H_{12}O_2$	0.8
64	Dibromochloromethane	$CHBr_2Cl$	10
65	Dibromoethane 1, 2-	$C_2H_4Br_2$	2
66	Dichloro-1-propene, 2, 3-	$C_3H_4Cl_2$	1.4
67	Dichlorobenzene o-	$C_6H_4Cl_2$	0.5

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
68	Dichloroethene, 1, 1-	$C_2H_2Cl_2$	0.95
69	Dichloroethene, cis-1, 2-	$C_2H_2Cl_2$	0.8
70	Dichloroethene, trans-1, 2-	$C_2H_2Cl_2$	0.7
71	Dichloroethylene 1, 2-	$C_2H_2Cl_2$	0.75
72	Dichloromethane	CH_2Cl_2	39
73	Dicyclopentadiene	$C_{10}H_{12}$	0.81
74	Diesel Fuel		0.75
75	Diethyl ether	$C_4H_{10}O$	0.88
76	Diethyl sulphide	$C_4H_{10}S$	0.55
77	Diethylamine		1
78	Diethylaminoethanol, 2-	$C_6H_{15}ON$	2.7
79	Diethylaminopropylamine, 3-	$C_7H_{18}N_2$	1
80	Diisobutylene	C_8H_{16}	0.64
81	Diisopropyl ether	$C_6H_{14}O$	0.68
82	Diisopropylamine	$C_6H_{15}N$	0.7
83	Diketene	$C_4H_4O_2$	2.2
84	Dimethoxymethane	$C_3H_8O_2$	1.4
85	Dimethyl cyclohexane, 1, 2-	C_8H_{16}	1.05
86	Dimethyl disulphide	$C_2H_6S_2$	0.23
87	Dimethyl ether	C_2H_6O	1.3
88	Dimethyl sulphide	C_2H_6S	0.5
89	Dimethylamine	C_2H_7N	1.4
90	Dimethylaniline, NN-	$C_8H_{11}N$	0.6

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
91	Dimethylethylamine, NN-	$C_4H_{11}N$	0.8
92	Dimethylformamide	C_3H_7NO	0.9
93	Dimethylheptan-4-one, 2, 6-	$C_9H_{18}O$	0.8
94	Dimethylhydrazine, 1, 1-	$C_2H_8N_2$	1
95	Dioxane 1, 2-	$C_4H_8O_2$	1.5
96	Dioxane 1, 4-	$C_4H_8O_2$	1.5
97	Diphenyl ether	$C_{12}H_{10}O$	0.8
98	Divinylbenzene	$C_{10}H_{10}$	0.4
99	Epichlorohydrin	C_3H_5ClO	8
100	Epoxypropyl isopropyl ether, 2, 3	$C_6H_{12}O_2$	1.1
101	Ethanol	C_2H_6O	8.72
102	Ethanolamine	C_2H_7NO	3
103	Ethoxyethanol, 2-	$C_4H_{10}O_2$	29.83
104	Ethyl (S)-(-)-lactate	$C_5H_{10}O_3$	3
105	Ethyl acetate	$C_4H_8O_2$	3.63
106	Ethyl acrylate	$C_5H_8O_2$	2
107	Ethyl amine	C_2H_7N	1
108	Ethyl benzene	C_8H_{10}	0.54
109	Ethyl butyrate	$C_6H_{12}O_2$	0.95
110	Ethyl chloroformate	$C_3H_5O_2Cl$	83
111	Ethyl formate	$C_3H_6O_2$	29.83
112	Ethyl hexyl acrylate, 2-	$C_{11}H_{20}O_2$	1
113	Ethyl mercaptan	C_2H_6S	0.69

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
114	Ethylene		8
115	Ethylene glycol	$C_2H_6O_2$	20
116	Ethylene oxide	C_2H_4O	15
117	Furfural	$C_5H_4O_2$	1.38
118	Furfuryl alcohol	$C_5H_6O_2$	2
119	Gasoline vapors		1.05
120	WMD Methyl salicylat	$C_8H_{19}O_4$	1
121	Gasoline vapors 92 octane		0.8
122	Germane	GeH_4	10
123	Glutaraldehyde	$C_5H_8O_2$	0.9
124	Heptan-2-one	$C_7H_{14}O$	0.73
125	Heptan-3-one	$C_7H_{14}O$	0.75
126	Heptane n-	C_7H_{16}	2.06
127	Hexan-2-one	$C_6H_{12}O$	0.8
128	Hexane n-	C_6H_{14}	3.28
129	Hexene, 1-	C_6H_{12}	0.9
130	Hydrazine	H_4N_2	3
131	Hydrogen sulfide	H_2S	4
132	Hydroquinone	$C_6H_6O_2$	0.8
133	Iminodi(ethylamine) 2, 2-	$C_4H_{13}N_3$	0.9
134	Iminodiethanol 2, 2'-	$C_4H_{11}NO_2$	1.6
135	Indene	C_9H_8	0.46
136	Iodine	I_2	0.15

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
137	Iodoform	CHI_3	1.5
138	Iodomethane	CH_3I	0.4
139	Isoamyl acetate	$C_7H_{14}O_2$	1.6
140	Isobutane	C_4H_{10}	8
141	Isobutanol	$C_4H_{10}O$	3.5
142	Isobutyl acetate	$C_6H_{12}O_2$	2.25
143	Isobutyl acrylate	$C_7H_{12}O_2$	1.3
144	Isobutylene	C_4H_8	1
145	Isobutyraldehyde	C_4H_8O	1.2
146	Isooctane	C_8H_{18}	1.08
147	Isooctyl alcohol	$C_8H_{18}O$	1.5
148	Isopentane	C_5H_{12}	6
149	Isophorone	$C_9H_{14}O$	0.75
150	Isoprene	C_5H_8	0.69
151	Isopropanol	C_3H_8O	4.35
152	Isopropyl acetate	$C_5H_{10}O_2$	2.2
153	Isopropyl chloroformate	$C_4H_7O_2Cl$	1.6
154	Jet Fuel JP-4		0.75
155	Jet Fuel JP-5		0.65
156	Jet Fuel JP-8		0.65
157	Kerosene		0.83
158	Ketene	C_2H_2O	3
159	Mesitylene	荚	0.3

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
160	Methacrylic acid	$C_4H_6O_2$	2.29
161	Methanol	CH_4O	206.37
162	Methoxyethanol, 2-	$C_3H_8O_2$	2.7
163	Methoxyethoxyethanol, 2-	$C_5H_{12}O_3$	1.4
164	Methoxymethylethoxy-2-propano	$C_6H_{14}O_3$	1.3
165	Methoxypropan-2-ol	$C_4H_{10}O_2$	3
166	Methoxypropyl acetate	$C_6H_{12}O_3$	1.2
167	Methyl acetate	$C_3H_6O_2$	5.18
168	Methyl acrylate	$C_4H_6O_2$	3.4
169	Methyl bromide	CH_3Br	1.9
170	Methyl ethyl ketone	C_4H_8O	0.76
171	Methyl isobutyl ketone	$C_6H_{12}O$	0.8
172	Methyl isothiocyanate	C_2H_3NS	0.6
173	Methyl mercaptan	CH_4S	0.7
174	Methyl methacrylate	$C_5H_8O_2$	1.6
175	Methyl propyl ketone	$C_5H_{10}O$	0.79
176	Methyl sulphide	C_2H_6S	0.5
177	Methyl t-butyl ether		0.8
178	Methyl-2-propen-1-ol, 2-	C_4H_8O	1.05
179	Methyl-2-pyrrolidinone, NMethyl-	C_5H_9NO	0.9
180	5-hepten-2-one, 6-	$C_8H_{14}O$	0.8
181	Methylamine	CH_5N	1.4
182	Methylbutan-1-ol, 3-	$C_5H_{12}O$	3.4

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
183	Methylcyclohexane	C_7H_{14}	1.1
184	Methylcyclohexanol, 4-	$C_7H_{14}O$	2.4
185	Methylcyclohexanone 2-	$C_7H_{12}O$	0.95
186	Methylheptan-3-one, 5-	$C_8H_{16}O$	0.75
187	Methylhexan-2-one, 5-	$C_7H_{14}O$	0.75
188	Methylhydrazine	CH_6N_2	1.3
189	Methylpent-3-en-2-one, 4-	$C_6H_{10}O$	0.72
190	Methylpentan-2-ol, 4-	$C_6H_{14}O$	2.8
191	Methylpentane-2, 4-diol, 2-	$C_6H_{14}O_2$	4
192	Methylpropan-2-ol, 2-	$C_4H_{10}O$	3.5
193	Methylstyrene	C_9H_{10}	0.53
194	Mineral spirits		0.8
195	Naphthalene	$C_{10}H_8$	0.44
196	Nitric oxide	NO	8
197	Nitroaniline 4-	$C_6H_6N_2O_2$	0.8
198	Nitrobenzene	$C_6H_5NO_2$	1.7
199	Nitrogen trichloride	NCl_3	1
200	Nonane, n-	C_9H_{20}	1.27
201	Octane, n-	C_8H_{18}	1.58
202	Octene, 1-	C_8H_{16}	0.69
203	Oxydiethanol 2, 2-	$C_4H_{10}O_3$	4
204	Pentan-2-one	$C_5H_{10}O$	0.79
205	Pentan-3-on	$C_5H_{10}O$	0.8

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
206	Pentandione, 2, 4-	$C_5H_8O_2$	0.75
207	Pentane, n-	C_5H_{12}	7.88
208	Phenol	C_6H_6O	1.2
209	Phenyl propene, 2-	C_9H_{10}	0.44
210	Phenyl-2, 3-epoxypropyl ethe	$C_9H_{10}O_2$	0.8
211	Phenylenediamine, p-	$C_6H_8N_2$	0.6
212	Picoline, 3-	C_6H_7N	0.9
213	Pinene, alpha	$C_{10}H_{16}$	0.31
214	Pinene, beta	$C_{10}H_{16}$	0.31
215	Piperylene	C_5H_8	0.66
216	Propan-1-ol	C_3H_8O	4.8
217	Propane-1, 2-diol, total	$C_3H_8O_2$	10
218	Propene	C_3H_6	1.4
219	Propionaldehyde	C_3H_6O	1.68
220	Propionic acid	$C_3H_6O_2$	8
221	Propyl acetate, n-	$C_5H_{10}O_2$	2.5
222	Propylene oxide	C_3H_6O	7
223	Propyleneimine	C_3H_7N	1.3
224	Pyridine	C_5H_5N	0.75
225	Pyridylamine 2-	$C_5H_6N_2$	0.8
226	Styrene	C_8H_8	0.44
227	Terpinolene	$C_{10}H_{16}$	0.46
228	Tert-butanol	$C_4H_{10}O$	2.62

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
229	Tetrabromoethane, 1, 1, 2, 2-	$C_2H_2Br_4$	2
230	Tetrachloroethylene	C_2Cl_4	0.7
231	Tetrafluoroethylene	C_2F_4	1
232	Tetrahydrofuran	C_4H_8O	1.55
233	Toluene	C_7H_8	0.51
234	Toluene-2, 4-diisocyanate	$C_9H_6N_2O_2$	1.6
235	Tributylamine	$C_{12}H_{27}N$	1
236	Trichlorobenzene 1, 2, 4-		0.55
237	Trichloroethylene	C_2HCl_3	0.65
238	Triethylamine	$C_6H_{15}N$	0.9
239	Trimethylamine	C_3H_9N	0.5
240	Trimethylbenzene mixtures	C_9H_{12}	0.34
241	Trimethylbenzene, 1, 3, 5-	C_9H_{12}	0.34
242	Turpentine	$C_{10}H_{16}$	0.6
243	TVOC		1
244	Undecane, n-	$C_{11}H_{24}$	0.92
245	Vinyl acetate	$C_4H_6O_2$	1.1
246	Vinyl bromide	C_2H_3Br	1
247	Vinyl chloride	C_2H_3Cl	2.1
248	Vinyl-2-pyrrolidinone, 1-	C_6H_9NO	0.9
249	Xylene mixed isomers	C_8H_{10}	0.43
250	Xylene, m-	C_8H_{10}	0.44
251	Xylene, o-	C_8H_{10}	0.6

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
252	Xylene, p-	C_8H_{10}	0.46
253	Xylidine, all	$C_8H_{11}N$	0.7
254	WMD Arsine	AsH_3	2
255	WMD Lewsite	ClCN	1.2
256	WMD Mustard Gas	$C_2H_2AsCl_3$	1
257	WMD N-Mustard Gas	$C_4H_{18}SCl_2$	1.1
258	WMD Sarin	$C_4H_{10}PO_2F$	3.1
259	WMD Soman	$C_7H_{116}P0_2F$	3.2
260	WMD Tabun	$C_5H_{11}PN_{202}$	1.2
261	WMD VX	$C_{11}H_{26}PNS_{02}$	1
262	WMD GF	$C_7H_{14}P_{02}F$	3.3
263	WMD DMMP	$C_3H_9P0_3$	5
264	WMD Triethyl phosphate	$C_6H_{15}P0_3$	3.5

Appendix VI : Non-Dispersive Infrared (NDIR) CxHy Module Target Gases and Corresponding Sensitivity Correction Factors

No.	Gas Name	Molecular Formula	Sensitivity Correction Factor
1	Methane	CH_4	1
2	Ethane	C_2H_6	≈ 0.2
3	Propane	C_3H_8	≈ 0.18
4	Butane	C_4H_{10}	≈ 0.18
5	Pentane	C_5H_{12}	≈ 0.15
6	Hexane	C_6H_{14}	≈ 0.17
7	Ethylene	C_2H_4	≈ 0.6
8	Ethanol	C_2H_6O	≈ 0.35
9	Propylene	C_3H_6	≈ 0.29
10	Cyclopentane	C_5H_{10}	≈ 0.27

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