Sniffer4D V2 Multi-gas Detection & Mapping System - Components & Specs (2022.05.11)			
Component Name		Functionalities & Specs	Remarks
Sniffer4D V2 Base Unit		• Ultra compact & lightweight structural design: 158x103x88mm, 400~500g depending on the sensing module selection (drone integration kits not included). • Anti EMI aluminium air-tight gas chamber with internal vibration reduction mechanism. • Active air intake with approx. 5L/min flow rate when subject to zero additional resistance. • Support 5VDC 2.5A Max (USB Type-C), or 7~32VDC 2A Max (XT30) power input. • Support ultra-low power consumption “Dormant Mode”, in which the most crucial sensing components still remain working when Sniffer4D V2 is not powered. "Dormant Mode" helps Sniffer4D V2 achieve negligible warm-up time after powering up. Energy storage component <1.11Wh with auto charging, charging time <60 min, lasts for >40 days per charge. • 1GHz ARM CPU and 512MB RAM. • 6 LEDs indicating Sniffer4D V2's working status: sensor assembly, GNSS, SD card, LTE, drone communication, and external device. • Built-in LTE connectivity with no external antenna. Support global 4G, 3G, EDGE, and GPRS network. A micro SIM card needs to be provided by the user. • Real-time encrypted data transmission (1Hz) with data retrieval algorithm. • 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). • Built-in high-precision Global Navigation Satellite System (GNSS) with not external antenna. Supports GPS, GLONASS, Galileo, and Beidou. • Front & rear high-brightness RGB warning LEDs with solid or blinking options. The LEDs can be configured to automatically vary their color according to the gas/PM concentrations. • Swarm supported. One or multiple Sniffer4Ds can communicated with one or multiple PCs. • Fully support DJI Payload SDK (PSDK) V2 (a M300 RTK or M210 series integration kit needs to be selected, see below). The user can view Sniffer4D's real-time data or control Sniffer4D using DJI Pilot App running on the DJI remote controller. • Support mission data backup with Sniffer4D's built-in SD card module. • Support Over-the Air (OTA) firmware update.	• APN may also needs to be set after inserting the Micro SIM card into Sniffer4D V2.
Sniffer4D Mapper Data Visualization & Analysis Software		• Display real-time working status of Sniffer4D, including device name, GNSS satellite number, relative altitude, volume of data to be retrieved. • Control Sniffer4D V2'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 contour line gas/PM concentration heat map. • Generate real-time 3D point cloud gas/PM concentration heat map. • Display real-time drone camera view and save geo-tagged screenshots ("Video Streaming Service" needs to be selected). • Estimate Fuel Sulfur Content (FSC) using proprietary inversion algorithm. • Support loading multiple historical data files into the software for post analysis. • Support loading an orthophoto (GeoTiff, WGS84) and displaying it under the concentration heat maps. • Support loading geo-tagged photos and showing their locations in the concentration heat map. • Support automatic PDF mission report generation. • Support exporting mission files as a CSV datasheet. • Track and display multiple Sniffer4Ds simultaneously. • 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. • Output decoded Sniffer4D data (json) using UDP. • Unlimited software installations and automatic software updates.	• Require 64-bit Windows 10 OS.
Selectable Internally-mounted Modules Up to 8 internal modules can be installed inside a Sniffer4D V2 base unit. Choose the modules that fit your application.	Inhalable Particulate Matter (PM2.5&10) Sensing Module	• Detection method: laser scattering/light scattering; • 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% @ 0.3um, 98% @> 0.5um; • Range: 0~1500ug/m3; • Detection limit: 1ug/m3; • Repeatability: <2% FS; • Theoretical Resolution: 1ug/m3; • Warm-up time from a cold start: <10s; • Overall response time: <10s; • Estimated service life: >36 months; • On-chip proprietary humidity correction algorithm, enabling better data quality in wide humidity range.	• For general environmental monitoring.

	High-resolution O3+NO2 Sensing Module	• Detection method: electrochemistry; • Sensitive to both O3 and NO2, but unable to identify individual concentrations; • Range: 0~11ppm; • Detection limit: 5ppb; • Repeatability: <4%FS; • Overall response time (t90): <45s (0~1ppm); • Theoretical resolution: <1ppb; • On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Support "Dormant Mode", warm-up time from a cold start: < 10s; • Sensitivity drift: -20~-40%/year (in laboratory environment); • Zero drift: 0~20ppb/year (in laboratory environment); • Est. service life: >24months; • Operating temperature: -30~40°C; • Operating humidity: 15-85%RH.	• For general environmental monitoring. • Individual O3 concentration is calculated using: O3=(O3+NO2) -NO2
	High-resolution NO2 Sensing Module	• Detection method: electrochemistry; • Range: 0~11ppm; • Detection limit: 5ppb; • Repeatability: <4%FS; • Overall response time (t90): <60s (0~2ppm); • Theoretical resolution: <1.1ppb; • On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Support "Dormant Mode", warm-up time from a cold start: < 10s; • Sensitivity drift: -20~-40%/year (in laboratory environment); • Zero drift: 0~20ppb/year (in laboratory environment); • Est. service life: >24months; • Operating temperature: -30~40°C; • Operating humidity: 15-85%RH.	• For general environmental monitoring, HAZMAT response, and ship fuel sulfur content monitoring.
	High-resolution CO Sensing Module	• Detection method: electrochemistry; • Range: 0~11ppm; • Detection limit: 4ppb; • Repeatability: <4%FS; • Overall response time (t90): <20s (0~10ppm); • Theoretical resolution: <0.6ppb; • On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Support "Dormant Mode", warm-up time from a cold start: < 10s; • Sensitivity drift: <10%/year (in laboratory environment); • Zero drift: <±100ppb/year (in laboratory environment); • Est. service life: >36months; • Operating temperature: -30~50°C; • Operating humidity: 15-90%RH.	• For general environmental monitoring and HAZMAT response.
	High-resolution SO2 Sensing Module	• Detection method: electrochemistry; • Range: 0~15ppm; • Detection limit: 5ppb; • Repeatability: <4%FS; • Overall response time (t90): <40s (0~2ppm); • Theoretical resolution: <0.8ppb; • On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Support "Dormant Mode", warm-up time from a cold start: < 15s; • Sensitivity drift: <±15%/year (in laboratory environment); • Zero drift: <±20ppb/year (in laboratory environment); • Est. service life: >36months; • Operating temperature: -30~50°C; • Operating humidity: 15-90%RH.	• For general environmental monitoring and HAZMAT response.

	Wide-range Volatile Organic Compounds (VOCs) Sensing Module	• Detection method: photoionization detection (PID); • Target gases: volatile organic compounds (VOCs) with ionization potential energies <10.6eV; • Range: 0~50ppm (isobutylene); • Detection limit: 1ppb; • Repeatability: <4% FS; • Response time (t90): <3 seconds (diffusion mode); • Theoretical resolution: 3.8 ppb; • On-chip proprietary individual difference compensation algorithms; • Humidity has almost no effect on the measurement in 0~75%RH; • Warm-up time froma cold start: about 5min; • Estimated service life: 5000 working hours; • Operating temperature: -40~55°C; • Operating humidity: 0-95%RH; • The default target gas is isobutylene. To measure other types of VOC, users need to adjust the sensitivity correction factor of the module.	• For general environmental monitoring, oil & gas leak detection, and HAZMAT response.
	Wide-range H2S Sensing Module	• Detection method: electrochemistry; • Range: 0~90ppm; • Detection limit: 20ppb; • Repeatability: <4%FS; • Overall response time (t90): <55s (0~2ppm); • Theoretical resolution: <3.7ppb; • On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Support "Dormant Mode", warm-up time from a cold start: < 15s; • Sensitivity drift: <20%/year (in laboratory environment); • Zero drift: <±100ppb/year (in laboratory environment); • Est. service life: >24months; • Operating temperature: -30~50°C; • Operating humidity: 15-90%RH.	• For general environmental monitoring, oil & gas leak detection, and HAZMAT response.
	Wide-range CxHy/CH4/LEL Sensing Module	• Detection method: non-dispersive infrared (NDIR); • Target gases: hydrocarbons (flammable gases); • Range: 0~5%VOL (0~100%LEL) methane, or 0~2%VOL propane; • Detection limit: 0.01%; • Repeatability: <2%FS; • Accuracy: ±10%; • Response time (t90): <30s; • Theoretical resolution: 0.01%/100ppm; • On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: about 45s; • Zero drift: <±0.05% VOL/month; • Estimated service life: >5 years; • Operating temperature: -20~50°C; • Operating humidity: 0~95%RH; • The default target gas is methane (CH4). To measure other types of hydrocarbon, users need to adjust the sensitivity correction factor of the module.	• For general environmental monitoring, oil & gas leak detection, and HAZMAT response.
	Wide-range CO2 Sensing Module	• Detection method: non-dispersive infrared (NDIR); • Range: 0~5%VOL; • Detection limit: 0.01%; • Repeatability: <2%FS; • Accuracy: ±10%; • Response time (t90): <30s; • Theoretical resolution: 0.01%/100ppm; • On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: about 45s; • Zero drift: <±0.05% VOL/month; • Estimated service life: >5 years; • Operating temperature: -20~50°C; • Operating humidity: 0~95%RH.	• For HAZMAT response.

	Wide-range NH3 Sensing Module	• Detection method: electrochemistry; • Range: 0~100ppm; • Detection limit: 5ppm; • Repeatability: <5%FS; • Overall response time (t90): <150s (0~50ppm); • Theoretical resolution: <0.2ppm; • On-chip proprietary individual difference compensation algorithms; • Support "Dormant Mode", warm-up time from a cold start: < 30s; • Sensitivity drift: <3%/year (in laboratory environment); • Zero drift: <±2ppm/year (in laboratory environment); • Est. service life: >24months; • Operating temperature: -30~50°C; • Operating humidity: 15-90%RH.	• For HAZMAT response.
	Wide-range HCl Sensing Module	• Detection method: electrochemistry; • Range: 0~100ppm; • Detection limit: 1ppm; • Repeatability: <4%FS; • Overall response time (t90): <200s (0~25ppm); • Theoretical resolution: <15ppb; • On-chip proprietary individual difference compensation algorithms; • Support "Dormant Mode", warm-up time from a cold start: < 30s; • Est. service life: >24months; • Operating temperature: -30~50°C; • Operating humidity: 15-90%RH.	• For HAZMAT response.
	Wide-range O2 Sensing Module	• Detection method: electrochemistry; • Range: 0~50%; • Detection limit: 0.5%; • Overall response time (t90): <15s (20.9%~0); • Theoretical resolution: <0.1%; • On-chip proprietary individual difference compensation algorithms; • Warm-up time from a cold start: about 60s; • Est. service life: >24months; • Operating temperature: -30~55°C; • Operating humidity: 5-95%RH; • Operating pressure: 80~120kPa.	• For HAZMAT response.
	Wide-range SO2 Sensing Module	• Detection method: electrochemistry; • Range: 0~100ppm; • Detection limit: 50ppb; • Repeatability: <4%FS; • Overall response time (t90): <40s (0~2ppm); • Theoretical resolution: <8ppb; • On-chip proprietary environmental and individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • 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: >36months; • Operating temperature: -30~50°C; • Operating humidity: 15-90%RH.	• For HAZMAT response, and ship fuel sulfur content monitoring.
	Wide-range H2 Sensing Module	• Detection method: electrochemistry; • Range: 0~5000ppm; • Detection limit: 17ppm; • Repeatability: <5%FS; • Overall response time (t90): <55s (0~400ppm); • Theoretical resolution: <0.7ppm; • On-chip proprietary individual difference compensation algorithms; • Support "Dormant Mode", warm-up time from a cold start: < 30s; • Zero drift: <±10ppm/year (in laboratory environment); • Est. service life: >24months; • Operating temperature: -30~50°C; • Operating humidity: 15-90%RH.	
	Cl2 Sensing Module	• Detection method: electrochemistry; • Range: 0~20ppm; • Detection limit: 0.5ppm; • Repeatability: <4%FS; • Overall response time (t90): <60s (0~10ppm); • Theoretical resolution: <10ppb; • On-chip proprietary individual difference compensation algorithms; • Support "Dormant Mode", warm-up time from a cold start: < 30s; • Est. service life: >24months; • Operating temperature: -20~50°C; • Operating humidity: 15-90%RH.	• For HAZMAT response.

	Wide-range PH3 Sensing Module	• Detection method: electrochemistry; • Range: 0~2000ppm; • Detection limit: 20ppm; • Repeatability: <5%FS; • Overall response time (t90): <30s (0~800ppm); • Theoretical resolution: <0.15ppm; • On-chip proprietary individual difference compensation algorithms; • Support "Dormant Mode", warm-up time from a cold start: < 30s; • Sensitivity drift: <4%/year (in laboratory environment); • Zero drift: <1.5ppm/year (in laboratory environment); • Est. service life: >24months; • Operating temperature: -20~50°C; • Operating humidity: 20-90%RH.	
	Wide-range CO Sensing Module	• Detection method: electrochemistry; • Range: 0~1000ppm; • Detection limit: 70ppb; • Repeatability: <4%FS; • Overall response time (t90): <20s (0~10ppm); • Theoretical resolution: <0.6ppb; • On-chip proprietary individual difference compensation algorithms; • Support "Dormant Mode", warm-up time from a cold start: < 5s; • Est. service life: 36 months; • Operating temperature: -30~50°C; • Operating humidity: 15-90%RH	
	NO Sensing Module	• Detection method: electrochemistry; • Range: 0~11ppm; • Detection limit: 5ppb; • Repeatability: <4%FS; • Overall response time (t90): <60s (0~2ppm); • Theoreticalresolution: <1.1ppb; • On-chip proprietary individual difference compensation algorithms; • Support "Dormant Mode", warm-up time from a cold start: < 5s; • Est. service life: 24 months; • Operating temperature: -30~40°C; • Operating humidity: 15-85%RH	
	Wide-range HCN Sensing Module	• Detection method: electrochemistry; • Range: 0~100ppm; • Detection limit: 50ppb; • Repeatability: <5%FS; • Overall response time (t90): <120s (0~30ppm); • Theoretical resolution: <0.05ppm; • On-chip proprietary individual difference compensation algorithms; • Support "Dormant Mode", warm-up time from a cold start: < 30s; • Est. service life: >12months; • Operating temperature: -30~50°C; • Operating humidity: 15-90%RH	
	OU Sensing Module	• Detection method: Electrochemistry; • Range: 0~10ppm; • Detection limit: 0.1ppm; • Repeatability: <5%FS; • Overall response time (t90): <30s (0~10ppm); • Theoretical resolution: 0.01ppm; • Est. service life: 36 months; • Operating temperature: 0~25°C; • Operating humidity: 30-70%RH	
Optional Externally-mounted Modules Installed outside Sniffer4D V2 base unit.	Gas Sampling Module	• Connect to Sniffer4D V2's "Sampler" port. • Start or manually stop gas sampling via DJI Pilot App or Sniffer4D Mapper. • Monitor air pressure inside the sampling bag and stop automatically when the bag is full. • Quick release mount for DJI M300RTK or M210. Can also be platform agnostic. • Include 1x1L sampling bag. Also adaptable to bags with different capacities.	
	Ultrasonic Wind Speed & Direction Sensing Module	• Connect to Sniffer4D V2's "Ext. Istm." port. • No moving parts. • Wind speed range & resolution: 0-50m/s, 0.1m/s. • Wind speed accuracy: ±0.1m/s (0-10m/s), ±1% (11-30m/s), ±2% (31-50m/s). • Wind direction range & resolution: 0-360°, 1.0°. • Wind direction accuracy: ±1.0°. • Built-in algorithms for compensating translational motion, attitude, and rotational motion, enabling wind measurement while in motion*.	*Currently support DJI M210 & M300 RTK

	TDLAS Methane Detection Sensing Module	• Connect to Sniffer4D V2's “Ext. Istm.” port. • Weight: 250g; • Detection method: Tunable Diode Laser Absorption Spectroscopy (TDLAS); • Range: 0~15000ppm; • Detection Limit: 1ppm; • Theoretical Resolution: 1ppm; • Estimated service life: >4 years.	*Currently support DJI M300 RTK
	Nuclear Radiation Sensing Module	• Detection method: Energy Compensation-based Geiger-Müller Counter; • Range: 0.1μSv/h ~ 8.3mSv/h; • Theoretical resolution: 0.01μSv/h; • Single accumulation range: 0.01μSv ~ 16000μSv; • Sensitivity: 1.2μGy/h (60Co radiation source); • Energy range: 30KeV ~ 3MeV; • Power consumption: 0.2W; • Warm-up time: about 20s; • Detection limit: about 0.1μSv; • Operating temperature: -40°C~60°C; • Estimated service life: 8.3×10^8μSv (10^9 pulses); • Size: 140x120x40mm; • Weight: 86.7g (net weight, bracket not included); • Installation: Mounted underneath the drone cabin. Connect to Sniffer4D V2 through "Ext. Istm." port and USB Type-C cable for both power supply and data transmission.	Available 2020 Q4 (est.)
	Ultraviolet Spectrophotometry Ozone Sensing Module	• Connect to Sniffer4D V2's “Ext. Istm.” port.	Available 2020 Q4 (est.)
	External GNSS Module	• Connect to Sniffer4D V2 via a USB Type-C cable. • Can be used in scenarios where Sniffer4D V2's built-in GNSS module does not have good reception, for example, when the Sniffer4D V2 is placed upside down.	
Data Connection Services	Data Connection Service	• Provide real-time internet data transmission between Sniffer4D V2 and Sniffer4D Mapper software. • Encrypted data transmission.	
	Video Streaming Service	• Stream live camera view (720p/1080p) remotely to Sniffer4D Mapper. • Confirmed compatibility with DJI M210 series, M300 RTK, and M600 series. May also be compatible with other drone platforms.	
	Plaintext Data Forwarding Service	• Forward the decoded real-time measurement data (json) from the Sniffer4D V2 to a user-specified IP address using TCP/UDP.	Available 2020 Q4 (est.)
Drone Integration Kits	DJI M300 RTK Integration Kit	• Quickly mount a Sniffer4D V2 onto a DJI M300 RTK aircraft. • Material: high-strength aluminium alloy. • When the Sniffer4D V2 is powered by a DJI SkyPort, the user can view the real-time readings and control the Sniffer4D V2 via DJI Pilot App running on the DJI remote controller. • The Sniffer4D V2 can be powered alternatively by the OSDK port in the aircraft using the OSDK power adapter that comes with the kit.	
	DJI Mavic 2 Series Integration Kit	• Compatible with Mavic 2 Enterprise / Enterprise Dual / Enterprise Dual Advanced / Pro / Zoom. • Material: high-performance nylon. • The Sniffer4D V2 is powered by Mavic 2's battery. • Max flight time 16 mins.	
	DJI M210/M210 RTK Integration Kit	• Quickly mount a Sniffer4D V2 onto a DJI M210/M210 RTK (V1 or V2) aircraft. • Material: high-strength aluminium alloy. • When the Sniffer4D V2 is powered by a DJI SkyPort, the user can view the real-time readings and control the Sniffer4D V2 via DJI Pilot App running on the DJI remote controller. • The Sniffer4D V2 can be powered alternatively by the XT30 port in the aircraft.	
	DJI M600 Pro Integration Kit	• Quickly mount a Sniffer4D V2 onto a DJI M600/M600 Pro aircraft. • Material: high-strength carbon fiber. • The Sniffer4D V2 is powered by the XT30 port in the aircraft. The kit includes a XT30 splitter cable so that powering other equipment (e.g. the Z3 camera) is not affected.	
After-sales Supports & Services	1-year Warranty for Non-human Damages	• For non-human damages, all repair costs are covered by Soarability during the standard 1-year warranty period.	

	Remote Training & Technical Support	• During warranty period, remote training & technical support are provided via phone and video conferencing. • Face-to-face training & support can be arranged (additional cost may occur).	
	Advanced Calibration Service	• The user follows the guidelines provided by Soarability's support engineer to obtain datasets from reference instruments and Sniffer4D V2. • Soarability computes the new calibration parameters for the device and guide the user to write the parameters into Sniffer4D V2.	
	Warranty Extension	• Extend the default warranty for 1-2 more years. Policies need to be made case by case. • In principle, warranty extension needs to be purchased together with the product.	
	Paid Repairing Service	• For man-made damages, you could send the broken product back to the manufacturer for paid repair, or ask the manufacturer to send out a technical to repair the product onsite.	
Product Customiza-tion	Base Unit Top Surface Logo Customization	• Customize laser-engraved logo on the top surface of Sniffer4D V2. • Details about the manufacturer and the product (laser-engraved on the bottom of Sniffer4D V2) 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.	