Sniffer4D Mini2 Multi-gas Detection & Mapping System - Components & Specs (2024.01.01)

Component Name	Functionalities & Specs	Remarks
Sniffer4D Mini2 Base Unit	• Ultra compact & lightweight structural design: 102*103*72mm. • Weight: <300g. • Water Proof: IPX2 Rating. • Injection molding with strong engineering plastic. • 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). • 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. • DJI M30 PSDK Power Port (Specific power cable required). • ARM CPU: 64-bit 1GHz ARM CPU and 512MB RAM. • 6 LEDs indicating Sniffer4D Mini2's working status: sensor assembly, GNSS, SD card, LTE, aircraft communication, and external device. • 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. • 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. • 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.) • 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 supported. One or multiple Sniffer4Ds can communicated with one or multiple PCs. • 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.	* 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.
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 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. • Display real-time aircraft camera view and save geo-tagged screenshots ("Video Streaming Service" needs to be selected). • Estimate Fuel Sulfur Content (FSC) using proprietary inversion algorithm. (cost separately) • 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. Live orthomaps are updated in real time. • 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 Windows10 operating system. Optional functions can be activated after purchase

Selectable Internally-mounted 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	• 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: 0~1000ug/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.
	Total Suspension Particular Matter (TSP/PM100) Sensing Module	• Detection method: laser scattering/light scattering; • Sense PM100 (TSP) (particle size 1~100um); • Range: 0~20mg/m3； • Theoretical Resolution: 1ug/m3； • Overall response time: <6s; • Est. service life: 36 months; • On-chip proprietary humidity correction algorithm, enabling better data quality in wide humidity range.	
	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; • Warm-up time from a cold start: ≈2minutes; • 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 (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.	• For general environmental monitoring. • This combination is also called "Ox", or "photochemical oxidant", which represents the oxidizing ability of the air • 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; • 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 (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.	• 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: 5ppb; • Repeatability: <4%FS; • Overall response time (t90): <20s (0~10ppm); • Theoretical resolution: ~3ppb; • 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: ≈2minutes; • Sensitivity drift: <10%/year (in laboratory environment); • Zero drift: <±100ppb/year (in laboratory environment); • Est. service life: >36months; • 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.	• 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: <1ppb; • 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: ≈2minutes; • Sensitivity drift: <±15%/year (in laboratory environment); • Zero drift: <±20ppb/year (in laboratory environment); • Est. service life: >36months; • 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.	• For general environmental monitoring, HAZMAT response, and ship fuel sulfur content monitoring.
	Wide-range Volatile Organic Compounds (TVOC) Sensing Module	• Detection method: photoionization detection (PID); • Target gases: total volatile organic compounds (TVOC) with ionization potential energies <10.6eV; • Range: 0~50ppm (isobutylene); • Detection limit: 5ppb; • Repeatability: <4%FS; • Response time (t90): <3s (diffusion mode); • Theoretical resolution: ~1ppb; • On-chip proprietary, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: ≈5minutes; • Estimated service life: 5000 working hours; • Operating temperature: -40~55°C; • Operating humidity: 0-95%RH; • Humidity has almost no effect on the measurement in 0~75%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: ~5ppb; • 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: ≈3minutes; • Sensitivity drift: <20%/year (in laboratory environment); • Zero drift: <±100ppb/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.	• 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%/100ppm; • Repeatability: <2%FS; • Accuracy: ±10%; • Response time (t90): <30s; • Theoretical resolution: 0.01%; • On-chip proprietary temperature 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 / 50000ppm; • Detection limit: 0.01%100ppm; • Repeatability: <2%FS; • Accuracy: ±10%; • Response time (t90): <30s; • Theoretical resolution: 0.01%/100ppm; • On-chip proprietary temperature 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: 1ppm; • Repeatability: <2%FS; • Overall response time (t90): <50s (0~50ppm); • Theoretical resolution: <0.2ppm; • On-chip proprietary individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Sensitivity drift: <3%/year (in laboratory environment); • Zero drift: <±2ppm/year (in laboratory environment); • Est. service life: >24months; • Operating temperature: -40~50°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.	• For odor detection and 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, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: ≈5minutes; • 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.	• For oil & gas leak detection and HAZMAT response.
	Wide-range O2 Sensing Module	• Detection method: electrochemistry; • Range: 0~50%; • Detection limit: 1%; • Overall response time (t90): <200s (0~25ppm); • Theoretical resolution: <0.1%; • On-chip proprietary individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: about 60s; • Est. service life: >24months; • Operating temperature: -30~55°C (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.	• 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; • Warm-up time from a cold start: ≈2minutes; • Sensitivity drift: <±15%/year (in laboratory environment); • Zero drift: <±20ppb/year (in laboratory environment); • Est. service life: >36months; • 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.	• For HAZMAT response.
	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, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: ≈2minutes; • 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.	• For H2 leakage monitoring in power station accidents.
	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: <20ppb; • On-chip proprietary individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: ≈5minutes; • 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.	• 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: ~0.3ppm; • On-chip proprietary individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: ≈5minutes; • Sensitivity drift: <4%/year (in laboratory environment); • Zero drift: <1.5ppm/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.	• Commonly used to check the phosphine gas emitted in the process of drug production.
	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: ~50ppb; • 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: ≈2minutes; • 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.	

	High-resolution NO Sensing Module	• Detection method: electrochemistry; • Range: 0~11ppm; • Detection limit: 5ppb; • Repeatability: <4%FS; • Overall response time (t90): <60s (0~10ppm); • Theoreticalresolution: <1.1ppb; • 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: ≈5minutes; • 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	• For general environmental monitoring and HAZMAT response.
	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: <0.1ppm; • On-chip proprietary individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: ≈5minutes; • Est. service life: >12months; • 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	• For HAZMAT response.
	Wide-range HF Sensing Module	• Detection method: electrochemistry; • Range: 0~100ppm; • Detection limit: 1ppm; • Repeatability: <4%FS; • Overall response time (t90): <200s (0~25ppm); • Theoretical resolution: ~20ppb; • On-chip proprietary individual difference compensation algorithms, enabling better data quality in wide temperature and humidity ranges; • Warm-up time from a cold start: ≈5minutes; • 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.	
	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: 0.01ppb; • Warm-up time from a cold start: ≈3minutes; • 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).	• Commonly used to check the phosphine OU emitted in environmental inspection.
	HCHO Sensing Module	• Detection method: solid-state electrochemistry; • Range: 0~100ppm; • Detection limit: 1ppm; • Accuracy: ±5%FS; • Repeatability: <2%; • Overall response time (t90): <80s (0 to 50ppm); • Theoretical resolution: 0.1ppm; • Est. service life: >36months; • Operating temperature: -40~55°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).	

Optional Externally-mounted Modules Installed outside Sniffer4D Mini2 base unit.	Ultrasonic Wind Speed & Direction Sensing Module	• Ultrasonic detection method with 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*.
	MP-TDLAS Methane Sensing Module	• Detection method: Multi-path Tunable Diode Laser Absorption Spectroscopy (MP-TDLAS); • Range: 0~10000ppm; • Detection Limit: 1ppm; • Theoretical Resolution: 1ppm; • Overall response time: 1s; • Weight: ≥250g; • MP-TDLAS methane sensing module has excellent gas selectivity, which is only sensitive to methane. The frequency of the light source may be consistent with the absorption frequency of gas molecules. • Compared with wide-range CxHy/CH4/LEL sensing module, its resolution is increased by 100 times.
	Gas Sampling Module	• Start or manually stop gaseous 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 M300/350. Can also be platform agnostic; • Include 2x1L sampling bag. Also adaptable to bags with different capacities.
	Nuclear Radiation Sensing Module	• Detection method: Energy Compensation-based Geiger-Müller Counter; • Energy range: 30KeV ~ 3MeV; • Radiation dose range: 0.083μSv/h ~ 3.5mSv/h; • Dose rate theoretical resolution: 0.05μSv/h; • Single accumulation range: 0.01μSv ~ 16000μSv; • Sensitivity: 1.2μGy/h (60Co radiation source); • Power consumption: 0.2W; • Warm-up time: about 40s; • Detection limit: about 0.1μSv; • Estimated service life: 8.3×10^{8}μSv (10^{9} pulses); • Size: 140x120x40mm; • Weight: 86.7g (net weight, bracket not included); • Operating temperature: -35~80°C (Note that the module may require readjustment on its zero point due to changes in operating temperature or working environment.); • Installation: Mounted underneath the drone cabin.

	1 ppm NDIR CO2 Sensing Module	• Detection method: Non-dispersive Infrared (NDIR); • Range: 0~2000ppm; • Detection limit: 1ppm; • Repeatability: ±2%FS; • Response time (500ml/min): <3s; • Theoretical resolution: 1ppm; • Warm-up time from a cold start: 3 minutes; • Estimated service life: 5 years; • Operating temperature: -20~50°C; • Operating humidity:0~85%RH;	• For Greenhouse Gases (GHG) monitoring
	External Temperature & Humidity Sensing Module	• Size: 65.5*41*145mm • Weight: 95.5g • Range: 0~ 100 %RH • Stability: ±2%RH (2 years) • Operating temperature: -20~50°C • Accuracy: *Humidity Temperature ranges from 0 to +40°c ± 1.5%RH (0 ~ 90%RH) ±2.5 %RH (90 ~ 100 %RH) Temperature ranges from -40 ~0°C, +40 ~+80°C ±3.0 %RH (0 ~90 %RH) ± 4.0% RH (90 ~100 %RH) *Temperature ±0.1°C at +15 ~ +25°C ±0.15°C at 0 ~ +15 °C, +25 ~ +40°C ±0.4°C at -40~0°C, +40 ~+80°C	
	External GNSS Module	• Connect to Sniffer4D Mini2's functional expansion bay via a USB-C cable. • Support GPS, GLONASS, Galileo, and Beidou with a position precision of ~±2m.	