Sniffer4D Mini2 Multi-gas Detection & Mapping System - Module Specs (2023.09.01)

Component Name		Functionalities & Specs	Remarks
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℃ ~+55℃ (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*.	
	TDLAS Methane Sensing Module	• Range: 0~15000ppm; • Detection Limit: 1ppm; • Theoretical Resolution: 1ppm; • Overall response time: 1s; • Weight: ⩾250g; • Detection method: Tunable Diode Laser Absorption Spectroscopy (Closed-path TDLAS); • 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.	

	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: 8.3×10^8μSv (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℃ • 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 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. • Support GPS, GLONASS, Galileo, and Beidou with a position precision of ~±2m.	