synetica enLink

enLink Air - Wireless Air Quality Monitor

Specifications

Frequency range	868 / 915 MHz*
Protocol	LoRa®
Receiver sensitivity	-135dBm @ 980bps
RF Transmit power	Up to +18dBm
Antenna	Integrated
Certifications	Pre-certified radio regulatory approvals: 868 & 915 MHz spectrum CE RoHS
Voltage	12-24V Volts DC. 1 Amp (max)
Processor	ARM® Cortex® M0+
Air circulation fan	Built in, automatically controlled, long life fan for forced air circulation
Dimensions	200mm x 100mm x 40mm
Weight	150g (depending on sensor options)
Orientation	Vertical wall mounting or horizontal ceiling mounting
Operating	-10 – 60°C 0 – 95%RH, Non-Condensing
Case materials	Aluminium profile AlMgSi 0,5. Silver anodized Plastic parts ASA+PC-FR. Black (RAL 9005)

Temperature Humidity Light level VOC's Pressure CO_2 O_2 Sound Particles x4 Plus 4 Gases

Sensor Characteristics (For sensors fitted as standard)

Temperature	Accuracy: ±0.2°C (typical) Repeatability: ±0.1°C Conversion time: 6.35ms
Humidity	Accuracy: ±2% (typical) Repeatability: ±0.1% Response time: 15s
Pressure	Accuracy: ±0.12hPa (equivalent to ±1m in altitude) Range (with full accuracy): 300 – 1100hPa Resolution: 0.18Pa
Light level	Less than 4% error Precision optical filtering to match human eye: Rejects > 99% of IR (typical). Range: 0.01 lux to 83,000 lux Light source variation (incandescent, halogen, fluorescent): 4%
Particulate Matter	MCERTS Certified Particles measured: PM0.5, PM1, PM2.5, PM4 & PM10 Sensing method: Laser-based light scattering particle sensing Concentration range: 0 – 1,000 µg/m3 Accuracy: PM1, PM2.5 0 µg/m3 to 100 µg/m3 ± 10 µg/m3 100 µg/m3 to 1000 µg/m3 ±10 % m.v. Accuracy: PM4, PM10 0 µg/m3 to 100 µg/m3 ± 25 µg/m3 100 µg/m3 to 1000 µg/m3 ±25 % m.v. Mass concentration resolution: 1 µg/m3 Lower limit of detection: 0.3 µm Response Time: < 6s (t90) Sensor life expectancy: > 8 years Maintenance Interval: No maintenance required
Sound - Optional	Sensitivity: -26dB FS ±1dB SNR: 65dBA Dynamic Range: 91dBA Acoustic Overload Point: 120dB SPL Total Harmonic Distortion: 0.2% (Typical) @ 105dB SPL
O_2	Sensing method: Fluorescence–based optical technology Accuracy: <2% ppO_2 Pressure ±5 mbar Range: 0-25% O_2 Resolution: 0.01% Response Time: < 30s (t90, typical) Sensor life expectancy: > 5 years Maintenance Interval: No maintenance required
VOC's	IAQ Index 0 to 500 (see below) ppm (bVOC) Response time: (tτ33-63%) 1 s Sensor life expectancy: > 10 years Maintenance Interval: No maintenance required
CO_2	Sensing method: Optical. Non-dispersive infrared (NDIR) Accuracy: ±(30, +3%) ppm (typ) Range: 0 – 5,000 ppm Extended range 0 – 10,000 ppm Response time: 3 minutes (t90) Sensor life expectancy: >15 years Maintenance Interval: No maintenance required

Selection Guide / Ordering Information

Part Number	Temperature	Humidity	Light Level*	VOC's	Pressure	CO_2	O_2	Particulates PM1, 2.5, 4, 10
ENL-AIR	•	•	•	•	•	•	•	•

*Light level is not present on enLink Air-X

Order part number **ENL-AIR** for base enLink Air model with the sensors listed in the table above.

The base enLink Air model can be enhanced with up to four gas sensors from the sensor selection guide in the section below.

Example 1, to order the unit with a Carbon Monoxide sensor the part number is:

ENL-AIR, AQS-CO-10M

Example 2, to order the unit with Carbon Monoxide, Ozone and Nitrogen Dioxide (0-5ppm) sensors the part number is:

ENL-AIR, AQS-CO-10M, AQS-O3-2, AQS-NO2-5

Sensor Selection Guide							
Parameter	Type	Range	Units	Part Number	Calibration Certificate	Specific Gravity (SG) NTP*	Distribution
°C	Temperature	-40 - 85	°C	Fitted as standard	Factory Calibrated		
%RH	Humidity	0 - 100	%	Fitted as standard	Factory Calibrated		
Pa	Pressure	300 - 1100	hPa	Fitted as standard	Factory Calibrated		
LUX	Ambient Light	0.01 - 83k	lux	Fitted as standard	Factory Calibrated		
PM	Particulate Matter	0 - 1,000	µg/m3	Fitted as standard	Factory Calibrated		
Sound	Decibels, A Weighted	91dBa	dB(A)	Option -S			
O2	Oxygen	0 - 25	%vol	Fitted as standard	Factory Calibrated	1.1044	Evenly Distributed
VOC	Volatile Organic Compounds	0 - 500	IAQ	Fitted as standard	Factory Calibrated	1	Evenly Distributed
CO_2	Carbon Dioxide	0 - 5000	ppm	Fitted as standard	✓	1.5189	Floor to Middle
NH_3	Ammonia	0 - 100	ppm	AQS-NH3-100	✓	0.59	Ceiling / roof
NH_3	Ammonia	0 - 100	ppm	AQS-NH3-100E	✓	0.59	Ceiling / roof
NH_3	Ammonia	0 - 500	ppm	AQS-NH3-500	✓	0.59	Ceiling / roof
NH_3	Ammonia	0 - 1000	ppm	AQS-NH3-1000E	✓	0.59	Ceiling / roof
CO	Carbon Monoxide	0 - 10	ppm	AQS-CO-10M	✓	0.9667	Evenly Distributed
CH_2O	Formaldehyde	0 - 1	ppm	AQS-CH2O-1	✓	1.067	Evenly Distributed
NO	Nitric Oxide	0 - 100	ppm	AQS-NO-100E	✓	1.037	Evenly Distributed
NO	Nitric Oxide	0 - 250	ppm	AQS-NO-250	✓	1.037	Evenly Distributed
NO	Nitric Oxide	0 - 2000	ppm	AQS-NO-2000	✓	1.037	Evenly Distributed
Air Pollutants	Air Pollutants: CO, Ammonia, Ethanol, H_2, Methane / Propane / Iso-Butane.	30 – 500	ppm	AQS-AP-500		1	Evenly Distributed
H_2S	Hydrogen Sulphide	0 - 100	ppm	AQS-H2S-100M	✓	1.1763	Floor to Middle
H_2S	Hydrogen Sulphide	0 - 500	ppm	AQS-H2S-500M	✓	1.1763	Floor to Middle
H_2S	Hydrogen Sulphide	0 - 2	ppm	AQS-H2S-2	✓	1.1763	Floor to Middle
NO_2	Nitrogen Dioxide	0 - 5	ppm	AQS-NO2-5	✓	1.58	Floor to Middle

NO_2	Nitrogen Dioxide	0 - 5	ppm	AQS-NO2-5-200B	✓	1.58	Floor to Middle
NO_2	Nitrogen Dioxide	0 - 5	ppm	AQS-NO2-5-DGS	✓	1.58	Floor to Middle
NO_2	Nitrogen Dioxide	0 - 50	ppm	AQS-NO2-50M	✓	1.58	Floor to Middle
NO_2	Nitrogen Dioxide	0 - 50	ppm	AQS-NO2-50E	✓	1.58	Floor to Middle
NO_2	Nitrogen Dioxide	0 - 100	ppm	AQS-NO2-100M	✓	1.58	Floor to Middle
NO_2	Nitrogen Dioxide	0 - 1000	ppm	AQS-NO2-1000M	✓	1.58	Floor to Middle
NO_2	Nitrogen Dioxide	0 - 2000	ppm	AQS-NO2-2000	✓	1.58	Floor to Middle
O_3	Ozone	0 - 2	ppm	AQS-O3-2	✓	1.66	Floor to Middle
SO_2	Sulphur Dioxide	0 - 5	ppm	AQS-SO2-5	✓	2.264	Floor
SO_2	Sulphur Dioxide	0 - 2000	ppm	AQS-SO2-2000	✓	2.264	Floor

*NTP - Normal Temperature and Pressure - is defined as 20°C (293.15K, 68°F) and 1 atm (101.325 kN/m2, 101.325 kPa, 14.7 psia, 0 psig, 30 in Hg, 760 torr)

Sensors are grouped according to Specific Gravity (SG). Gas sensors should be used on the same enLink Air unit when the gases are Evenly Distributed and from the same SG band.

Examples:
Oxygen + Carbon Dioxide (Oxygen is evenly distributed and Carbon Dioxide is heavier than air.)
Oxygen + ~~*Carbon Dioxide*~~ + ~~*Ammonia*~~. (Ammonia and Carbon Dioxide have different SG and therefore need to be in separate enLink Air units.)
Oxygen + Ammonia. (Oxygen is evenly distributed and Ammonia is lighter than air.)

(enLink Air must be mounted at the correct height for the gases to be measured).

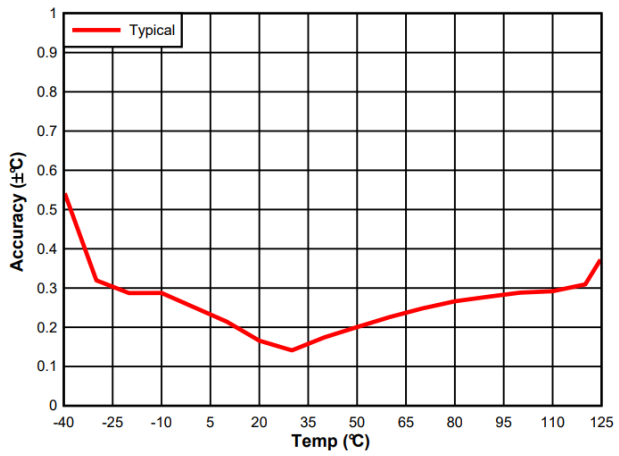
Temperature (°C)

Features

- Factory calibrated
- High accuracy digital sensor
- Excellent stability at high humidity

Specifications

Measurement:	Temperature °C
Operating Principle:	Digital
Measurement Range (full accuracy):	5°C to +60°C
Expected Operating Life:	> 10 years
Long Term Sensitivity Drift:	< 2% per month
Calibration:	Factory Calibrated
Resolution:	0.1°C
Accuracy (full range):	± 0.2°C
Temperature Range:	-20°C to +50°C
Humidity Range (non-condensing):	0 – 100 %RH
Response Time:	< 1 seconds
Storage Temperature:	-65 °C to +150 °C
Orientation Sensitivity:	None
Part Number:	Fitted as standard to enLink Air



Temperature Accuracy vs. Temperature

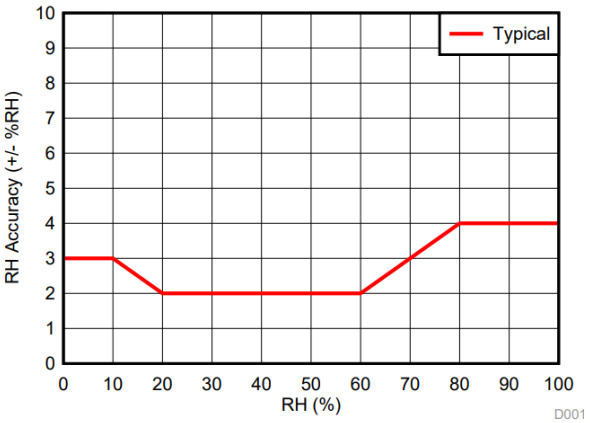
Humidity (%RH)

Features

- Factory calibrated
- High accuracy digital sensor
- Excellent stability at high humidity

Specifications

Measurement:	Relative Humidity %RH
Operating Principle:	Digital
Measurement Range (full accuracy):	0 – 100 %RH
Expected Operating Life:	> 10 years
Long Term Sensitivity Drift:	0.25 %RH per year
Calibration:	Factory Calibrated
Resolution:	0.1 %RH
Accuracy (full range):	± 2 %RH
Temperature Range:	-20°C to +70°C
Response Time:	< 1 seconds
Storage Temperature:	-65 °C to +150 °C
Orientation Sensitivity:	None
Part Number:	Fitted as standard to enLink Air



RH Accuracy vs. RH

Pressure (Pa)

Features

- Factory calibrated
- High accuracy digital sensor

Specifications

Measurement:	Relative Humidity %RH
Operating Principle:	Digital
Measurement Range (full accuracy):	300 – 1100 hPa
Expected Operating Life:	10 years
Long Term Sensitivity Drift:	1 hPa per year
Calibration:	Factory Calibrated
Resolution:	0.18 hPa
Accuracy (full range):	± 0.6 hPa
Temperature Range:	0°C to +65°C
Response Time:	< 10 seconds
Storage Temperature:	-45 °C to +85 °C
Orientation Sensitivity:	None
Part Number:	Fitted as standard to enLink Air

Ambient Light (lux)

Features

- Factory calibrated
- High accuracy digital sensor
- Precision optical filtering to match human eye (rejects >99% of IR)

Specifications

Measurement:	Ambient Light lux
Operating Principle:	Digital
Measurement Range (full accuracy):	0.01 – 83k lux
Expected Operating Life:	10 years
Sensitivity Drift:	0.01 % per °C
Calibration:	Factory Calibrated
Resolution:	0.01 lux
Accuracy (> 40 lux):	± 2%
Temperature Range:	0°C to +65°C
Response Time:	< 1 seconds
Storage Temperature:	-65 °C to +105 °C
Orientation Sensitivity:	None
Part Number:	Fitted as standard to enLink Air

Particulate Matter PM0.5 to PM10

Features

- MCERTS Certified
- Laser-based light scattering particle sensing
- Concentration range: 0 µg/m3 to 1,000 µg/m3
- Fully calibrated
- Long life
- High reliability
- High resolution

Specifications

Gas Detected:	Air Particles	
Operating Principle:	Laser-based light scattering particle sensing	
Measurement Range (full accuracy):	0 – 1000 µg/m3	
Expected Operating Life:	> 8 years (continuous)	
Calibration:	NA	
Resolution:	1 µg/m3	
Accuracy:	PM1, PM 2.5 0 µg/m3 to 100 µg/m3 100 µg/m3 to 1000 µg/m3 PM4, PM 10 0 µg/m3 to 100 µg/m3 100 µg/m3 to 1000 µg/m3	 ± 10 µg/m3 ± 10 % m.v. ± 25 µg/m3 ± 25 % m.v.
Number concentration size range	PM 0.5 0.3 - 0.5 PM 1.0 0.3 – 1.0 PM 2.5 0.3 – 2.5 PM 4 0.3 – 4 PM 10 0.3 - 10	µm µm µm µm µm
Temperature Range:	-10°C to +60°C	
Humidity Range (non-condensing):	0 – 95% RH	
Response Time (T90):	< 6 seconds	
Storage Temperature:	-40°C to +70°C	
Orientation Sensitivity:	As per mounting instructions	
Part Number:	Fitted as standard to enLink Air	

Oxygen (O_2)

Features

- Advanced optical technology rather than short-life electrochemical
- Long life due to non-depleting sensing principle
- Self-correcting for pressure and altitude variations

Specifications

Gas Detected:	Oxygen O_2
Operating Principle:	Fluorescence–based optical technology
Measurement Range:	0 – 25% O_2
Expected Operating Life:	> 5 years
Calibration:	Factory calibrated
Resolution:	0.01%
Accuracy:	< 2% Full Scale ppO_2
Temperature Range:	-30°C to +60°C
Pressure Range:	500 – 1200 mbar
Humidity Range (non-condensing):	0 – 99% RH
Response Time (T90):	< 30 seconds
Pressure Range (O_2):	0 – 300mbar ppO_2
Storage Temperature:	-30°C to +60°C
Orientation Sensitivity:	None
Part Number:	Fitted as standard to enLink Air

Volatile Organic Compounds VOC's (IAQ)

Features

- Factory calibrated
- Digital Indoor Air Quality sensor

Specifications

Measurement:	VOC IAQ Index and ppm (bVOC)
Operating Principle:	Metal Oxide Adsorption
Measurement Range (full accuracy):	0 – 500 IAQ
Expected Operating Life:	10 years
Long Term Sensitivity Drift:	4% per year
Calibration:	Factory Calibrated
Resolution:	1 IAQ, 0.001ppm
Accuracy:	± 15%
Temperature Range:	-40°C to +85°C
Humidity Range (non-condensing):	10 – 95% RH
Response Time:	< 2 seconds
Storage Temperature:	-45 °C to +85 °C
Orientation Sensitivity:	None
Part Number:	Fitted as standard to enLink Air

Indoor air quality (IAQ) classification and colour coding [1]

IAQ Index	Air Quality	Impact (long-term exposure)	Suggested action
0 – 50	Excellent	Pure air; best for wellbeing	No measures needed
51 – 100	Good	No irritation or impact on wellbeing	No measures needed
101 – 150	Lightly polluted	Reduction of wellbeing possible	Ventilation suggested
151 – 200	Moderately polluted	More significant irritation possible	Increase ventilation with clean air
201 – 250[1]	Heavily polluted	Exposition might lead to effects like headache depending on type of VOC	Optimise ventilation
251 – 350	Severely polluted	More severe health issue possible if harmful VOC present	Contamination should be identified if level is reached even without the presence of people; maximise ventilation and reduce attendance
> 351	Extremely polluted	Headaches, additional neurotoxic effects possible	Contamination needs to be identified; avoid presence in room and maximise ventilation

[1] According to the guidelines issued by the German Federal Environmental Agency, exceeding 25 mg/m^3 of total VOC leads to headaches and further neurotoxic impact on health.

Compliant to the ISO16000-29 standard “Test methods for VOC detectors”.

bVOC mixture with Nitrogen as carrier gas

Molar fraction	Compound	Certified accuracy
5 ppm	Ethane	5 %
10 ppm	Isoprene /2-methyl-1,3 Butadiene	5 %
10 ppm	Ethanol	5 %
50 ppm	Acetone	5 %
15 ppm	Carbon Monoxide	2 %

Carbon Dioxide (CO_2)

Features

- Advanced optical NDIR technology rather than short-life electrochemical
- Long life due to non-depleting sensing principle
- Self-correcting for pressure and altitude variations
- High reliability
- High resolution

Specifications

Gas Detected:	Carbon Dioxide CO_2
Operating Principle:	Non-dispersive infrared (NDIR)
Measurement Range (full accuracy):	0 – 5000 ppm
Expected Operating Life:	> 15 years
Calibration:	Automatic baseline correction
Resolution:	0.1 ppm
Accuracy:	+/- (30, +3%) of reading, ppm
Temperature Range:	0°C to +50°C
Humidity Range (non-condensing):	0 – 95% RH
Response Time (T90):	< 60 seconds
Storage Temperature:	0°C to +20°C
Orientation Sensitivity:	None
Part Number:	Fitted as standard to enLink Air

Ammonia (NH_3)

Features

- Hydrous electrolyte
- Highly sensitive
- Very selective - no CO_2 interference

Specifications

Gas Detected:	Ammonia NH_3	
Operating Principle:	Amperometric, 3-electrode	
Measurement Range (full accuracy):	AQS-NH3-100 AQS-NH3-500 AQS-NH3-1000	100 ppm 500 ppm 1000 ppm
Expected Operating Life:	> 18 months	
Long Term Sensitivity Drift:	< 2% signal per month	
Calibration:	Manufacturer Calibration Certificate	
Resolution:	AQS-NH3-100 AQS-NH3-500 AQS-NH3-1000	<0.5 ppm 3 ppm 5 ppm
Accuracy:	< 1% Full Scale	
Temperature Range:	-20˚C to +40˚C	
Pressure Range:	900 – 1100 mbar	
Humidity Range (non-condensing):	15 – 90% RH	
Response Time (T90):	< 90 seconds	
Storage Temperature:	0˚C to +20˚C	
Orientation Sensitivity:	None	
Part Number:	AQS-NH3-100 AQS-NH3-500 AQS-NH3-1000	

Carbon Monoxide (CO)

Features

- Long life
- High reliability
- High resolution
- Solid Polymer Electrochemical Sensing Technology

Specifications

Gas Detected:	Carbon Monoxide CO
Operating Principle:	Amperometric, 3-electrode
Measurement Range (full accuracy):	0 – 10 ppm Lowest Detection Limit (LDL): 0.1ppm
Expected Operating Life:	> 3 years (Relatively clean air, temperature 0-25 ° C, humidity 30-70%)
Long Term Sensitivity Drift:	< 1% per month
Calibration:	Manufacturer Calibration Certificate
Resolution:	0.01 ppm
Accuracy:	0ppm - 5ppm error is ± 2-5% (5ppm is the calculation unit) 5ppm - 10ppm error ± 5% (10ppm is the calculation unit)
Temperature Range:	-40°C to +55°C
Pressure Range:	Atm ± 10%
Humidity Range (non-condensing):	15 – 95% RH
Response Time :	<3 seconds (T50: <40 seconds; T90: <80 seconds; T100: <180 seconds;)
Storage Temperature:	-20°C to +55°C
Orientation Sensitivity:	None
Part Number:	AQS-CO-10M

Formaldehyde (CH_2O)

Features

- Long life
- High reliability
- High resolution
- Solid Polymer Electrochemical Sensing Technology

Specifications

Gas Detected:	Formaldehyde CH_2O
Operating Principle:	Electrochemical, 3-electrode
Measurement Range (full accuracy):	0 – 1 ppm
Expected Operating Life:	2 years
Long Term Sensitivity Drift:	< 2% per month
Calibration:	Manufacturer Calibration Certificate
Resolution:	0.001 ppm
Accuracy:	100ppb-200ppb error is ±15% (100ppbis the calculation unit) 200ppb-1000ppb error is ±10% (100ppbis the calculation unit)
Temperature Range:	-40˚C to +50˚C
Humidity Range (non-condensing):	15 – 90% RH
Response Time (T60):	< 60 seconds
Storage Temperature:	5˚C to +20˚C
Orientation Sensitivity:	None
Part Number:	AQS-CH2O-1

Air Pollutants

Features

- Metal oxide MEMS sensor

Specifications

Gas Detected:	Air Pollutants: CO, Ammonia, Ethanol, H2, Methane / Propane / Iso-Butane.
Operating Principle:	Metal oxide MEMS
Measurement Range (full accuracy):	Detectable Gas* — Range Carbon Monoxide CO — 1 – 1000ppm Ethanol C_2H_5OH — 10 – 500ppm Hydrogen H_2 — 1 – 1000ppm Ammonia NH_3 — 1 – 500ppm Methane CH_4 — > 1000ppm *The air Pollutants sensor is sensitive to the above gases but is unable to distinguish between them.
Expected Operating Life:	> 2 years
Long Term Sensitivity Drift:	< 2% per month
Calibration:	Manufacturer Calibration Certificate
Resolution:	0.1 ppm
Accuracy:	N/A
Temperature Range:	-20˚C to +50˚C
Humidity Range (non-condensing):	15 – 90% RH
Response Time (T60):	< 30 seconds
Storage Temperature:	5˚C to +20˚C
Orientation Sensitivity:	None
Part Number:	AQS-AP-500

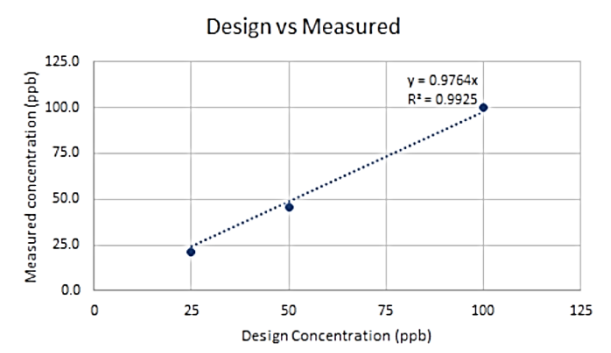
Ozone (O_3)

Features

- Nano gas Sensor
- Long life
- High reliability
- High Sensitivity to single digit ppb

Specifications

Gas Detected:	Ozone O_3
Operating Principle:	Nano Gas Sensor
Measurement Range:	0 – 2ppm
Expected Operating Life:	> 2 years
Calibration:	Factory calibrated
Resolution:	1ppb
Accuracy (@100ppb):	±10% of reading
Temperature Range:	5˚C to +65˚C
Humidity Range (non-condensing):	5 – 99% RH
Response Time (T90):	< 10 seconds
Storage Temperature:	0˚C to +50˚C
Orientation Sensitivity:	None
Part Number:	AQS-O3-2



Ozone Sensor percent error for Design versus Measured in laboratory environments show a 14.9% variance at 25 ppb; 8.5% variance at 50ppb and 0.1% variance at 100 ppb exposure.

Nitrogen Dioxide (NO_2)

AQS-NO2-5

Features

- Long life
- High reliability
- High resolution
- Solid Polymer Electrochemical Sensing Technology

Specifications

Gas Detected:	Nitrogen dioxide gas
Operating Principle:	Solid Polymer Electrochemical Sensing Technology
Measurement Range (full accuracy):	0 – 5 ppm
Lowest Detection Limit:	0.05ppm
Resolution:	0.001 ppm
Expected Operating Life:	>3 years Temperature (0-25) ℃, Humidity (30-70)% RH, the measured gas concentration is within the range, and there is no gas environment that affects the warm-up time mentioned above
Calibration:	Nitrogen dioxide standard gas 3ppm
Full-scale Accuracy:	± 5% F.S
Repeatability	<2%
Temperature Range:	-40 °C to +55 °C
Optimal Working Temperature:	20-35 °C
Humidity Range (non-condensing):	15 – 95% RH
Optimum working Humidity:	50% RH
Response Time:	T50: <10 seconds; T90: <30 seconds
Storage Temperature:	5°C to +20°C
Part Number:	AQS-NO2-5

Cross Sensitivity

Gas	Formula	Concentration	Response (ppm)
Formaldehyde	HCHO	10	0
Hydrogen	H2	1000	0
Benzene	C6H6	986.5	0
Ammonia	NH3	50	0
Ozone	O3	50	0
Methane	CH4	5000	0
Acetylene	C2H2	80.3	0
Isobutene	C4H8	300	0