Enviro Technology Services plc
Air Pollution Solutions

AirBase

PRODUCT OVERVIEW: CanarIT™ 1.0

October 2012

1. PRODUCT OVERVIEW

The CanarIT™ is a multi-sensor air quality monitoring device, designed for affordable network sensing – "a sensor web" – or as a single monitoring station.

The main functionality of the device is to identify, alert and log air quality events that may pose risks to human health and the environment. The device continuously measures levels of air pollutants, and transmits the data over the Internet for cloud-based storage and processing.

2. DEVICE

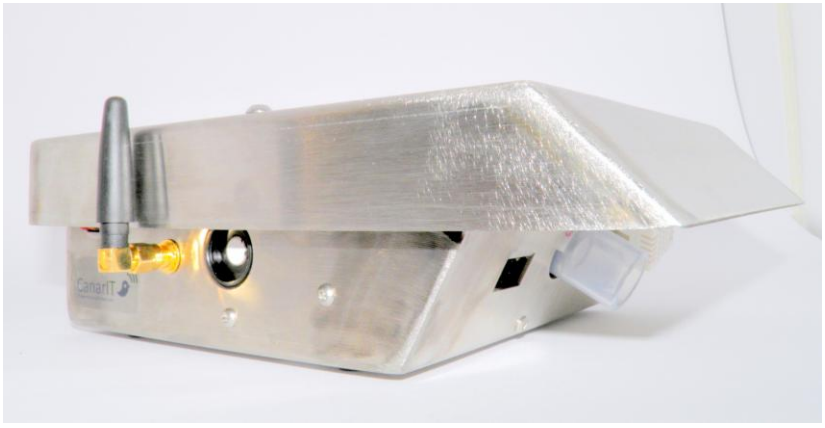
The CanarIT™ 0.1 device monitors;

- NO_2
- O_3 - can be replaced (with additional cost) with:
  - Odour
  - Ammonia – NH_3
  - Carbon Monoxide-CO
  - Hydrogen- H_2
  - Hydrogen Sulfide- H_2S
  - Methane- CH_4
  - Perchloroethylene- C_4Cl_4
  - Sulfur dioxide- SO_2
- Total Volatile Organic Compounds (T VOC)
- Total Suspended Particles / Dust (PM10)
- Noise
- Temperature
- Relative Humidity

Size:

Length – 26 cm, width 17 cm, height 7 cm.

CanarIT™ 1.0:



The device sends data automatically and periodically over the Internet. The device user-interface is based on Web Pages and Google Earth/Maps.

The unit is not operational if it is not connected to the Internet and to the AirBase cloud-based servers.

3. USER MANUAL

The CanarIT is a plug & play multi-sensor unit with minimal human handling. After positioning the unit at the desired location all user-interface is done through our web page. No need to physically handle the unit.

4. INSTALLATION MANUAL

The CanarIT unit is supplied in a special case. It is supplied with the following items:

1. 1 CanarIT 0.1 unit
2. 1 electricity wire and currency adapter to 12v.
3. USB wire
4. Helen key
5. Product overview & manual

How to install:

Please refer to CanarIT Installation guide.

5. POSITIONING

Outdoor: The CanarIT needs to be positioned under shade from sun, and cover from rain. Balcony or window can be a good spots.

Indoor: Try to position you sensor at the height level of the people/kids in the room.

6. MAINTANANCE MANUAL

Every six months remove the unit from its location and clean its surface and sensors inputs with a regular vacuum. It is preferable not to disconnect it from the electricity, but if need the unit can be disconnected and then connected again with no need to reregister it.

Calibration is being done remotely through the internet.

7. SERVICES

Our service includes access to data for the device/s purchased via a web site.

There are three service channels available for sensor buyers:

1. **Master Page** – shows streaming info.
2. **Mail Alerts** – single e-mail alert will be sent based on air quality exceeding a threshold (based on an average of last 30-minutes).
3. **Raw Data Page** - the device also produces 'raw' data that can be accessible in spreadsheet format and other communication formats and APIs.

Consulting & Installation Support

AirBase and its Certified Partners can provide consulting advice and installation support for the units.

4. VALIDATON AND CALIBRATION

The device undergoes an internal Quality Assurance process and is delivered when calibrated and ready for use. Any data calibration is performed remotely.

There is no need for any physical work to be conducted on the device itself. In the case of repeated mal-readings, a new device will be sent to the customer.

5. SAFTY AND DISPOSAL

The CanarIT™ device is equipped with two safety certifications:

a. **CE** - The **CE marking** is a mandatory conformity mark for products placed on the market in the European Economic Area (EEA). With the CE marking on a product, the manufacturer ensures that the product conforms to the essential requirements of the applicable EC Directives.

b. **FCC** - FCC is the abbreviation for the Federal Communications Commission. The FCC is responsible for rating personal computers and other equipment as either Class A or Class B. The ratings indicate how much radiation a personal computer emits.

Disposal of units

Please do not dispose of the unit yourself. Contact us for recall or recycling procedures. If you are unable to contact AirBase, please treat the unit as 'electronic waste' and dispose of the device in a proper manner according to the local laws and regulations.

6. INTERNET CONNECTIVITY

The CanarIT™ 0.1 has two different communication versions (each unit has only one pre-selected communication option); wireless Wi-Fi and wireless GSM (cellular). Each of the two communication options requires a different installation process.

CANARIT™ WI-FI

TECHNICAL INFORMATION

- Range 50-100 meter outdoor (Typical Estimate)
- Wi-Fi Certified Solution
- Compatible with IEEE 802.11b/g/n
- Supports 802.11i security
- Ambient temperature operating range: (-) 40 to (+) 85 [0c].

INSTALLATION

The Wi-Fi CanarIT™ installation requires Wi-Fi network selection and entering a password key (if the network is not an open one). This is done by installing client software on a PC and connecting the CanarIT™ to the PC with a USB cable. The software interface on the PC will show all available networks in the given range and will request the password of the selected network. Once the USB cable is disconnected, the unit will start transmitting the data automatically.

Specific instructions will be sent with the unit itself and our customer support will assist.

CANARIT™ GSM (CELLULAR)

GENERAL INFORMATION

- Network: GSM, GPRS Class 10
- Band: Full Quad band Support: 850/900/1800/1900 MHz
- SIM: 3V & 1.8 V supported

- Ambient temperature operating range: (-) 40 to (+)85 [0c].

INSTALLATION

Plug and play. Simply insert the SIM card in the device and plug the device into a power supply.

7. EXTERNAL INTERFACES

SERIAL COMMUNICATION

Mini USB; used for the Wi-Fi network configurations. Once the USB port is connected to a PC, the unit is in automatically in Wi-Fi network selection mode, when the port is disconnected the unit shifts to transmission mode.

POWER

12V DC, 250mA or more, 2.1mm plug, center pin positive.

LED DISPLAY

The unit has a LED display to mark the different modes of operation:

- Power On: Green
- Configuration Mode: Fast Yellow blinks
- Transmission mode: Slow yellow blinking (once every 20 seconds)

8. USER INTERFACE

The CanarIT™ user interface is web-based; the only option to access the sensor information is from a webpage. Each device has an individual web page accessed by a unique URL.

All sensor data is stored automatically on AirBase servers every 20 seconds (subject to change).

In the webpage the user has the following options:

- Dynamic symbol on Google Earth / Maps, the symbol color is determined by the sensor's results (i.e. good = green, moderate = yellow, bad = red).
- Dashboard with current status (gauge for each sensor)
- Ventilation instructions
- Pie chart of the sensor history showing distribution of good / moderate / bad conditions
- Graphs for each sensor. The graph displays results averaged every five minutes. The graph time range is user adjustable.

- Microsoft Excel file generation based on time range definition and row data / average data every five minutes.

Over time, we will be adding new features to the web services.

9. DISCLAIMER

AirBase Systems LTD. maintains this website to enhance public access to air quality information in general. Our goal is to keep this information timely and accurate. AirBase Systems LTD. reserves the right not to be responsible for the topicality, correctness, completeness or quality of the information provided. If errors are brought to our attention, we will try to correct them.

Parts of the pages or the complete publication including all information might be extended, changed or partly or completely deleted by the author without separate announcement.

This information is:

- of a general nature only and is not intended to address the specific circumstances of any particular individual or entity;
- not necessarily comprehensive, complete, accurate or up to date;
- sometimes linked to external sites over which AirBase Systems LTD. has no control and for which AirBase Systems LTD. assumes no responsibility;
- not professional, medical or legal advice

AirBase Systems LTD. is not responsible for any contents linked or referred to from these pages - unless it has full knowledge of illegal contents and would be able to prevent the visitors of its site from viewing those pages.

AirBase Systems LTD. is not liable for any postings or messages published by users of discussion boards, guest books, social networks or mailing lists provided on its page.

The copyright for any material created by AirBase Systems LTD. is reserved. Any duplication or use of such as images, diagrams, sounds or texts in other electronic or printed publications is not permitted without AirBase Systems LTD. agreement.

This disclaimer is to be regarded as part of the internet publication which you were referred from. If sections or individual formulations of this text are not legal or correct, the content or validity of the other parts remain uninfluenced by this fact.

10.SENSING CAPABILITIES

OZONE

The sensor is based on a nanotechnology-enhanced, gas-sensitive semiconductor to measure ozone in ambient air. The semiconductor is sensitive to ozone due to surface oxygen vacancies. Therefore, the sensing mechanism is based on decomposing the ozone, and filling of the vacancies, causing a measurable increase in resistance.

PERFORMANCE

- Calibrated range: 0 – 150 or 0 – 500 [ppb], (fixed after order)
- Lower detection limit: 1 [ppb]
- Accuracy of calibration: 6.5 [ppb]
- Resolution: 1 [ppb]
- Respond time: 65 [sec]
- Ambient temperature operating range: -5 to +40 [^{0}c]
- Relative humidity operating range: 5 to 95 [%]

COMPARISON WITH SCIENTIFIC REFERENCE INSTRUMENTS:

Validation tests were exhibiting low drift and tracking similar trends to reference methods with readings almost identical within the specified accuracy level (<± 8 ppb from 0 to 0.1 ppm and <± 10% from 0.1 to 0.5 ppm). Reference instrument: Thermo Electron Model TEI 49C ozone analyzer utilizing UV photometer US EPA Designated Method EQOA-0880-047

NITROGEN OXIDE (NO2)

NO_2 sensors are produced by placing a semiconducting, nano-crystalline metal oxide on a substrate and measuring the conductivity. By adding dopants of noble metals, the sensitivity towards NO_2 is influenced and allows a tuning of sensor performance for specific applications.

The sensor uses the following principles: NO_2 from ambient air is combusted at the sensor surface, reacting with oxygen atoms/molecules from the crystal lattice. Electrons, which are removed by this chemical reaction, lead to a lower conductivity of the semiconducting material.

PERFORMANCE

- Calibrated range: 10 – 2000 [ppb]
- Lower detection limit: 10 [ppb]
- Resolution: 5 [ppb]
- Respond time: 200 [msec]
- Ambient temperature operating range: (-) 40 to (+) 85 [0c]
- Relative humidity operating range: 5 to 95 [%]

VOLATILE ORGANIC COMPOUNDS (VOC)

VOC sensors are produced by placing a semiconducting, nano-crystalline metal oxide on a substrate and measuring the conductivity. By adding dopants of noble metals, the sensitivity towards VOCs is influenced and allows a tuning of sensor performance for specific applications.

The sensor uses the following principles: VOCs from ambient air are combusted at the sensor surface, reacting with oxygen atoms/molecules from the crystal lattice. Electrons,

which are released by this chemical reaction, lead to a higher conductivity of the semiconducting material.

PERFORMANCE

- VOC's detected: Alcohols, aldehydes, ketones, organic acids, amines, aliphatic and aromatic hydrocarbons
- Respond time: seconds
- Ambient temperature operating range: (-) 40 to (+) 120 [0c]
- Relative humidity operating range: 5 to 95 [%]

DYNAMIC RANGE

Compound	Formula	Range [ppm]	Potential Sources
Carbon monoxide	CO	0-10	Car exhaust, fuel-based heating, cooking appliances, smoking
Methane	CH_4	0-200	Natural gas
Propane	C_3H_8	0-20	Fuel-based heating, cooking appliances, cleaners
Ethyl alcohol	C_2H_6O	0-3	Cosmetics, cleaners, disinfectants, detergents, paints, coatings, breath
Acetaldehyde	C_2H_4O	0-20	Adhesives, coatings, plastics, lubricants, ripening of fruits
Methylethylketone	C_4H_8O	0-20	Adhesives, coatings, plastics, lubricants
Toluene	C_7H_8	0-5	Paints, coatings, cleaners, detergents, smoking, polyurethane lacquers

TOTAL SUSPENDED PARTICLES (TSP, I.E. DUST)

The dust sensing principle is an optical sensing system. An infrared emitting diode (IRED) and a phototransistor are diagonally arranged into the device. It detects the reflected light of dust in air. It is especially effective in detecting very fine particles of substances such as cigarette smoke. In addition, it can distinguish smoke from house dust by the pulse pattern of output voltage.

PERFORMANCE

- Sensitivity: 0.1 [mg/m3]
- Sensing pulse cycle: 10 [msec]
- Ambient temperature operating range: (-) 10 to (+)65 [0c]

TEMPERATURE AND RELATIVE HUMIDITY

This dual sensor is implemented in advanced semiconductor technology (CMOS) using specific micro system processing steps to produce the micro sensor structures on specially developed semiconductor parts. The relative humidity sensor element is built out of a capacitor. A polymer absorbs or releases water proportional to the relative environmental humidity, and thus changes the capacitance of the capacitor; this is called the dielectric.

PERFORMANCE

- Resolution: 0.04 0C / 0.7% Relative humidity
- Accuracy: ±0.30C / ±2% relative humidity
- Repeatability: ±0.10C / ±0.1% relative humidity
- Maximal respond time: 30 sec
- Ambient temperature operating range: (-) 40 to (+) 125 [0c]
- Relative humidity operating range: 0 to 100 [%]

NOISE

The noise sensor is based on an electrets microphone. The sensor is designed to alert on sound nuisance or damaging levels only.

PERFORMANCE

- Sensitivity: (-) 44 [dB]
- Directivity: Omni directional
- Sound to noise ratio: 55 [dB]
- Frequency range: 100 to 10,000 [Hz]
- Ambient temperature operating range: (-) 25 to (+) 45 [0c]
- Relative humidity operating range: 5 to 95 [%]

ODOR SENSOR (OPTIONAL)

The sensor is based on a nanotechnology-enhanced, gas sensitive semiconductor to measure odor levels in ambient air. The module is calibrated against the European Odor Unit (OUE) concentration scale, which is based on the response to 40 ppb of n-butanol as defined in EN 13725.

PERFORMANCE

- Dynamic Range: 0 – 5000 [OUE/m3]
- Sensitivity: 2 [OUE/m3]
- Resolution: 1 [OUE/m3]
- Ambient temperature operating range: (-) 10 to (+) 45 [0c].
- Relative humidity operating range: 10 to 95 [%].

APENDIX

POLLUTANTS AND SOURCES

Target	Emission Sources	Good for
Nitrogen Dioxide (NO2)	Fossil fuels combustion processes; motor vehicle, electricity generation, heating, cooking, etc.	Personal and community health protection Traffic management
Total Volatile Organic Compounds (VOC)	Household chemicals, solvent chemical process and fossil fuel combustion	Personal and community health protection Indoor air quality management. Traffic management Industrial emissions management
Dust	Natural / man made airborne particles; soot, fine sand, etc.	Personal and community health protection Indoor air quality management
Ozone (O3)	Secondary product of the interaction between motor vehicle / industrial emissions and sunlight.	Personal and community health protection Crop loss management Wildlife protection
Temperature & Relative Humidity	Weather and indoor elements	Personal and community health protection Energy savings Weather forecasting

AMBIENT AIR QUALITY STANDARDS

	EEA (EU)		EPA (USA)	
Gases	Levels	Averaging Time	Levels	Averaging Time
CO	43 [ppm] / 50 [mg/m^3]	0.5 hour	35 [ppm] / 40[mg/m^3]	1 hour
NO_2	105[ppb] / 200[µg/m^3]	0.5 hour	53[ppb] / 100[µg/m^3]	Annual mean
O_3	6o[ppb] / 120[µg/m^3]	0.5 hour	120[ppb] / 235[µg/m^3]	1 hour

Enviro Technology Services plc
Air Pollution Solutions
Kingfisher Business Park, London Road, Stroud, Gloucestershire GL5 2BY
Tel: +44 (0) 1453 733200 Fax: +44 (0) 1453 733201 Email: info@et.co.uk