MAGNASCI

uRADMonitor INDUSTRIAL
Environmental Monitoring

Temperature, Barometric pressure, Relative Humidity, Volatile organic compounds (VOC), Particulate matter PM1, PM2.5, PM10, Ozone O_3, Carbon Monoxide CO, Nitrogen Dioxide NO_2, Sulphur Dioxide SO_2, Noise level

Features

- 8 high quality digital sensors tracking 12 air parameters
- Four slots for electrochemical sensors, allowing custom gas detection, 26 gases supported
- Multiple connectivity options including WiFi, LoRaWAN
- USB port for power, data access, debug and configuration
- Relay Output pin to control one external relay
- Built-in air pump for active flow
- Alarms and notifications using built-in speaker
- Direct and Cloud data access via API
- Rugged design with aluminum enclosure
- Low power consumption
- Designed to support solar panels operation
- Compact size 150x60x30 mm
- Wall mounting support

Hardware Version
HW 105

Applications

- City monitoring
- Office and production space monitoring
- CBRN Monitoring
- Smart cities
- IOT / Internet of things

Description

uRADMonitor INDUSTRIAL is an automated, fixed monitoring station that tracks a total of 11 important air quality parameters. It is compliant to international requirements on determining the Air Quality Index. It comes in a rugged aluminum enclosure with wall mounting support. The data is exported to the uRADMonitor network and can be accessed in real time using the cloud API interface or directly via the local network.

With automated monitoring, data trends becomes possible thanks to continuous surveillance and a permanent data flux. We have a higher detection capability for small variations and can trigger automated alarms if predefined thresholds are reached, improving reaction time while lowering costs.

Using the available connectivity options and the low power consumption this device can be deployed for a large variety of field applications. Its versatility is combined with a convenient cloud based data access with an API interface to access the measurements directly from the uRADMonitor cloud.

Sensors

The device uses a high quality laser scattering sensor to measure the Particulate Matter PM1.0, PM2.5 and PM10 concentration in air. Four additional electrochemical sensors measure Carbon Monoxide, Sulphur Dioxide, Nitrogen Dioxide and Ozone by default, interchangeable to support additional gases. A MOX VOC sensor measures volatile organic compounds. A built in fan assures an active air flow stream across the sensing elements. The Bosch BME280 MEMS sensor reads ambient temperature, pressure and humidity, and a noise sensor measures the noise level.

SENSOR	PARAMETER	MINIMUM	MAXIMUM	RESOLUTION	ACCURACY	INTERVAL[1]	LIFESPAN[2]
Bosch BME280	Temperature	-40 °C	+85 °C	0.5 °C	± 1°C	-40..+100°C	5 years
	Pressure	300 hPa	1100 hPa	1 Pa	± 0.25%	-40..+100°C	
	Humidity	0% RH	100% RH	1% RH	± 3%	-40..+100°C	
Winsen ZH03A	PM1	0 µg/m³	1000 µg/m³	1 µg/m^3	±15%	-40..+100°C	5 years
	PM2.5	0 µg/m³	1000 µg/m³	1 µg/m^3	±15%	-40..+100°C	
	PM10	0 µg/m³	1000 µg/m³	1 µg/m^3	±15%	-40..+100°C	
Winsen MP503	VOCs	10 ppm[5]	1000 ppm[3]	-	± 15%	-40..+100°C	2 years
SPU414 with MAX4466	Noise level	30 dB	130 dB	1 dB	± 10%	-40..+100°C	2 years
Winsen ZE03-O_3	Ozone	0 ppm	20 ppm	0.02 ppm	± 10 %	-20..+50°C	2 years[4]
Winsen ZE03-CO	Carbon Monoxide	0 ppm	1000 ppm	0.5 ppm	± 10 %	-20..+50°C	2 years[4]
Winsen ZE03-SO_2	Sulphur Dioxide	0 ppm	20 ppm	0.1 ppm	± 10 %	-20..+50°C	2 years[4]
Winsen ZE03-NO_2	Nitrogen Dioxide	0 ppm	20 ppm	0.1 ppm	± 10 %	-20..+50°C	2 years[4]

[1] Using the sensor outside the recommended temperature interval can shorten its lifespan

[2] Estimated for normal usage conditions. Device maintenance is recommended after the shortest sensor lifespan interval (2 years).

[3] Estimated for alcohol.

[4] Operating life time until 50% original signal degradation (24 months warranted).

* All sensors are individually tested and calibrated.

Specification

Parameter	uRADMonitor INDUSTRIAL.Wifi	uRADMonitor INDUSTRIAL.LoraWAN
Internet connection	Wifi 2.4GHz	LoraWAN compliant with multiple international bands
Standards	IEEE 802.11b/g/n	IEEE 802.15.4g(FSK/GFSK)
Wireless frequencies	2400-2483.5MHz	IN865, EU868, US915, AU915, IL915, KR920, AS923
TX Power	100mW	25mW
Modem Chip	Espressif ESP8266	Microchip RN2483 / RN2903, RAK 811
Modem certifications	CE, FCC	CE, FCC, IC
Antenna connector	SMA male	SMA female
Enclosure Protection	IP30	IP30
Supply Voltage	6 - 28V / Solar	6 - 28V / Solar
Dimensions	110x65x25 mm (excl. sup)	110x65x25 mm (excl. sup)
Weight	210g	210g
Mounting	mounting support provided	mounting support provided
Recommended Use Ratings	Temperature: -20°C to +65°C	Humidity: 0RH to 95RH
Certifications	CE/ROHS 2018	

Usage conditions

- **Power supply:** Be careful not to exceed 28V as it will damage the unit. A 9V adapter is provided with the unit.
- **Outdoor use and exposure to elements:** Do not expose the device to direct sunlight, rain or snow. The aluminum case is not sealed, and water getting inside will damage the appliance. Do not cover the air circulation holes.
- **Precautions**: Do not expose the device to a large amount of dust such as in the woodworking centers. Do not expose the appliance to solvents or to a large amount of concentrated vapors of chemicals (acetone, paints, alcohol, butane, propane, etc.), because the sensors can wear out, or the measurements may become

inconclusive. Do not expose the apparatus to mechanical shocks. Wherever possible, mount the appliance in a vertical position to extend the life of the built-in fan mechanisms.

- **Installing the unit**
  For mounting, use the holes in the housing. Ensure that you properly connect the power cord and network cable and secure against vibration where necessary. Make sure the antenna is installed before powering the unit.

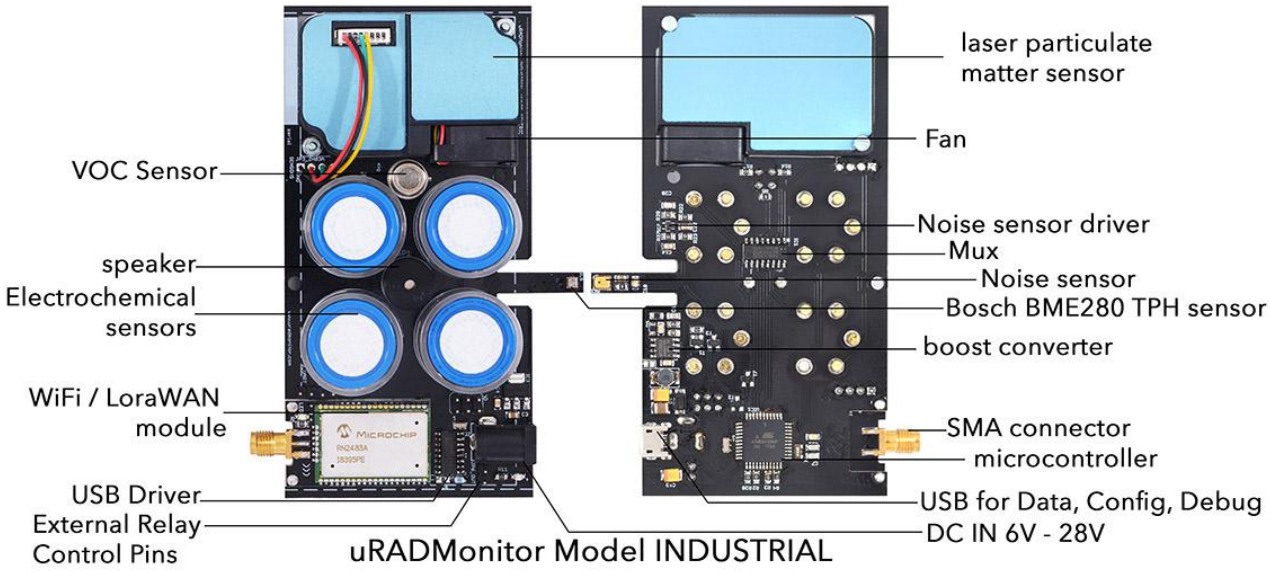
Additional gases supported

The 4 electrochemical sensors can be replaced with any combination of sensors for the following gases and ranges:

Symbol	Gas	Detection interval	Resolution
CO	Carbon monoxide	0 - 1000ppm	0.5ppm
O2	Oxygen	0 - 25%VOL	
NH3	Ammonia gas	0 - 100ppm	0.5ppm
H2S	Hydrogen sulfide	0 - 100ppm	0.1ppm
NO2	Nitrogen dioxide	0 - 20ppm	0.1ppm
HF	Hydrogen fluoride	0 - 10ppm	0.1ppm
SO2	Sulfur dioxide	0 - 20ppm	0.1ppm
Cl2	Chlorine gas	0 - 10ppm	0.1ppm
O3	Ozone	0 - 20ppm	0.02ppm
H2	Hydrogen gas	0 - 1000ppm	2ppm
HCl	Hydrogen chloride	0 - 20ppm	0.1ppm

Gases to be supported in the future:

C2H4	Ethylene	0 - 100ppm	0.5ppm
CH2O	Formaldehyde	0 - 10ppm	0.1ppm
ETO	Ethylene oxide	0 - 20ppm	0.1ppm
C6H6	Benzene	0 - 100ppm	0.1ppm
C7H8	Toluene	0 - 500ppm	1ppm
C2H3Cl	Vinyl chloride	0 - 20ppm	0.5ppm
C2H6S	Methyl Sulfide	0 - 100ppm	0.1ppm
C2H6S2	Dimethyl Disulfide	0 - 100ppm	0.1ppm
AsH3	Arsine	0 - 3ppm	0.01ppm
C3H9N	Trimethylamine	0 - 100ppm	1ppm
C8H8	Styrene	0 - 100ppm	0.1ppm
CH4S	Methanethiol	0 - 100ppm	0.1ppm
CS2	Carbon Disulfide	0 - 100ppm	0.1ppm
PH3	Phosphine	0 - 10ppm	0.05ppm
HCN	Hydrogen cyanide	0 - 100ppm	0.2ppm



Data access

uRADMonitor is designed for easy and open data access. The data can be accessed in two ways:

- **Local access**

Applies where the uRADMonitor unit is part of a LAN network (the Wifi variants). The uRADMonitor unit serves an internal webpage accessible via port 80. To access the content open the unit's IP in your LAN network on a computer or a phone.
There are two links at the bottom of the page.

The JSON link points to a JSON formatted data source, that can be polled periodically to access the uRADMonitor unit readings. As this is done directly by connecting to the uRADMonitor unit, the server compensation layer is not used, so you would receive the raw readings. This is not the preferred way, and additional compensation must be implemented (eg. Temperature offset to compensate for internal heating, other corrections, etc). This functionality is offered rather for debugging and decentralized operation in critical situations such as server failure or malfunction.
The other link named Config (or Wifi) is used to configure the Wifi settings so the uRADMonitor unit will be able to connect to your Internet router.

- **Data access via the Server RESTful API**

This is the preferred data access method. REST API does not require the client to know anything about the structure of the API. Rather, the server needs to provide whatever information the client needs to interact with the service. An HTML form is an example of this: The server specifies the location of the resource, and the required fields. The browser doesn't know in advance where to submit the information, and it doesn't know in advance what information to submit. Both forms of information are entirely supplied by the server. Lookups should use GET requests. PUT, POST, and DELETE requests should be used for creation, mutation, and deletion.

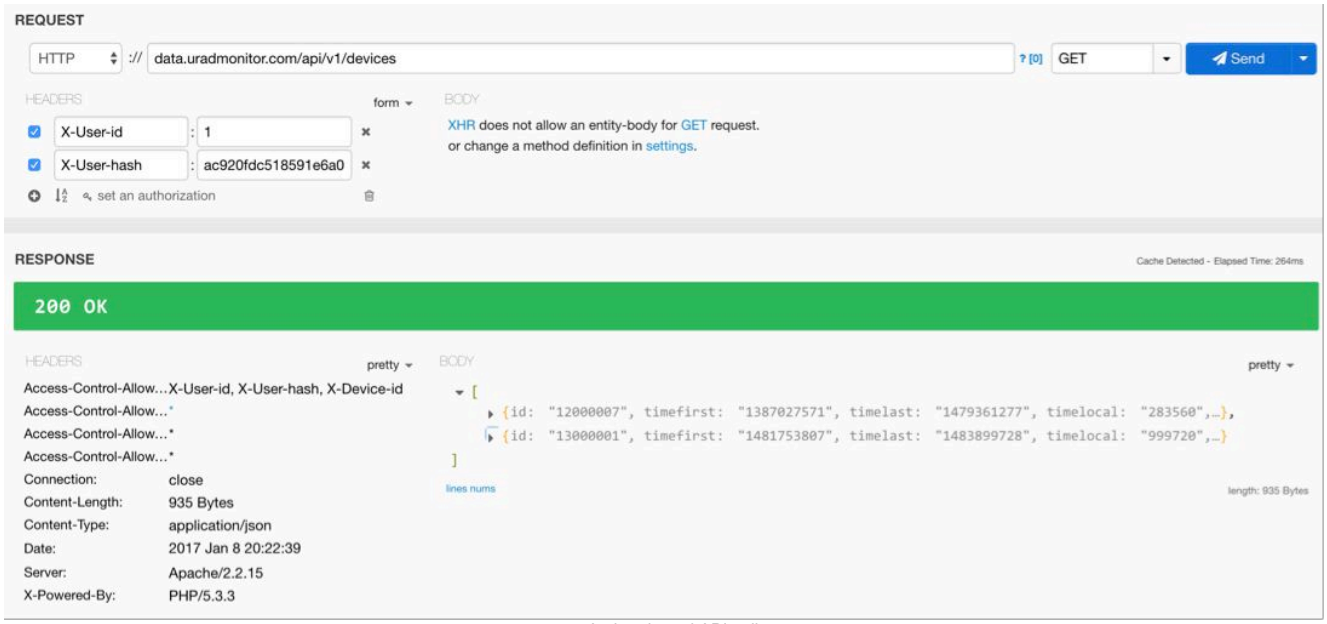
The API is called for both directions of data transfer (upload and download). The uRADMonitor devices use the API to upload their measurements to the server, for further processing and storage in the database. The API is then used to access data by the frontend, the mobile app or third party systems that need the uRADMonitor data.

Server API: Authentication

Some API calls require authentication with user ID and user Key and will return results depending on the privileges and settings of the given user. To authenticate a call, the HTTP GET header must contain two custom fields, defined as follows:

X-User-id	Will contain the user ID.
X-User-hash	Will contain the user Key.

Both the user ID and the user Key are displayed in the Dashboard. Here is call example, using the authentication headers:



Authenticated API call

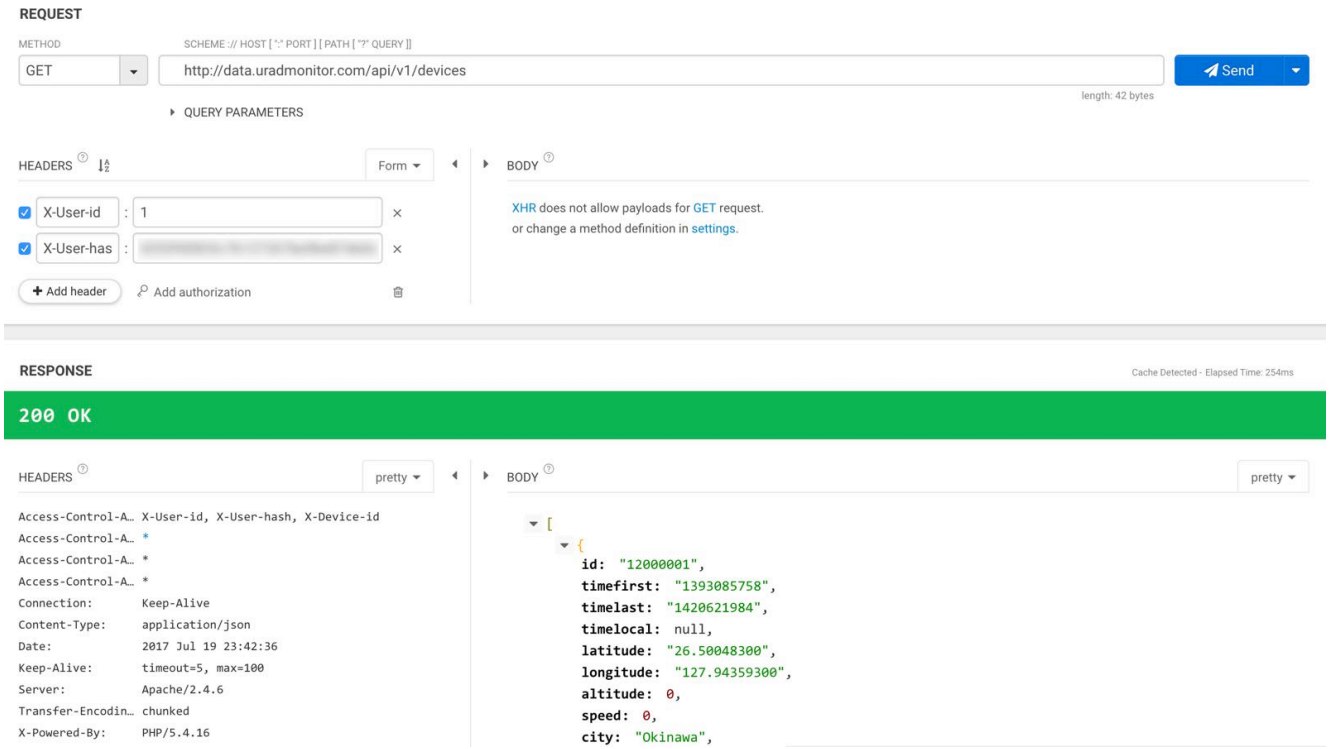
Below the list of API calls is presented. Those that require authentication will be marked accordingly.

Server API: API Calls for data access

For the uRADMonitor RESTful API, there is a common base url, defined as http://data.uradmonitor.com/api/v1/ followed by the following verbs:

1	*devices*	**Full URL**: https://data.uradmonitor.com/api/v1/devices
Method: HTTP GET		**Purpose**: data access
Description		Used to retrieve the list of uRADMonitor units assigned to the user account. The list includes the units the user is either set as owner or has global access to them.
Authentication		yes, using X-User-id and X-User-hash in HTTP Get header

Call example:



Return: summary array of uRADMonitor units in JSON format.

[{ **id :** "82000050", **timefirst :** "1476801965", **timelast :** "1499877474", **timelocal :** "120", **latitude :** "37.46906600", **longitude :** "-79.21035800", **altitude :** 213, **speed :** 0, **city :** "Lynchburg", **country :** "US", **versionsw :** "122", **versionhw :** "103", **status :** null, **mobile :** null, **detector :** "SI29BG", **factor :** 0.01, **avg_temperature :** "25.39", **avg_pressure :** "99268", **avg_humidity :** "67.13", **avg_voc :** "2669238", **min_voc :** "73049", **max_voc :** "11818108", **avg_co2 :** "514", **avg_ch2o :** "0.00", **avg_pm25 :** "950", **avg_noise :** "0.00", **avg_cpm :** "11.40", **avg_voltage :** "380.97", **avg_duty :** "219.68"}, {...}]

Each result in the array contains the following information:

id	the unique uRADMonitor unit ID
timefirst	unix timestamp containing the moment in time the unit first transmitted data
timelast	unix timestamp containing the moment in time of the last data transmission
timelocal	timestamp containing the number of seconds elapsed since the unit was last rebooted
latitude	latitude coordinate in decimal format
longitude	longitude coordinate in decimal format
altitude	altitude coordinate in meters
speed	unit speed in km/h
city	define base city for this unit
country	2 letter country code for the location of this unit
versionsw	firmware version
versionhw	hardware iteration version
status	1 if the unit is online, NULL if it is offline
mobile	1 if the unit is a mobile unit (eg. Model-D units or A3 units installed in buses)
detector	name of radiation detector sensor if the unit has such capabilities (only for Model A, KIT1, D and A3)
factor	CPM to Eq Dose Rate linear approximation conversion factor (dependent on "detector")
avg_XX	last 24hours average of the given sensor. Each unit model has a different number of avg_XX values returned, depending on its capabilities and the number of parameters it measures

2	*devices/[ID]*	**Full URL**: https://data.uradmonitor.com/api/v1/devices/[ID]
Method: HTTP GET		**Purpose**: data access
Description		ID is a unique uRADMonitor unit ID (eg. 110000AB) . This call is used to return the list of sensors of the specified unit.
Authentication		yes, using X-User-id and X-User-hash in HTTP Get header

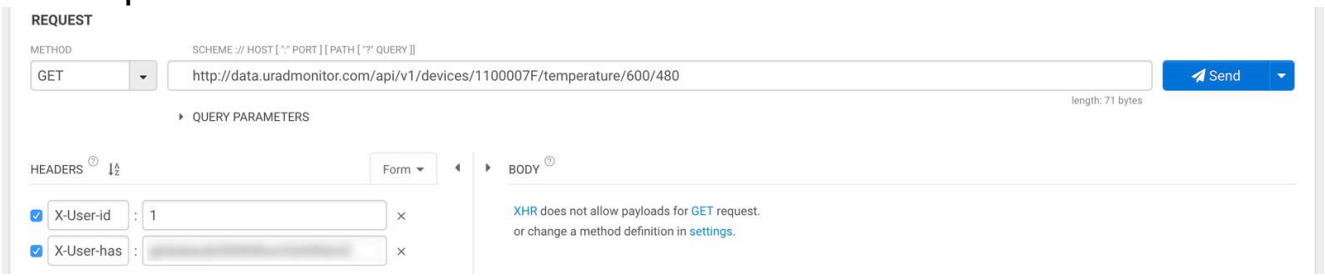
Call example:

Return: list of supported sensors as an array in JSON format, including the unit of measure:

{ temperature : ["Temperature","°C"], cpm : ["Radiation","cpm"], voltage :["Voltage","V"], duty : ["Duty cycle","‰"], all : ["All",""]}

3	*devices/[ID]/[sensor]/ [startinterval]/ [stopinterval]*	**Full URL**: https://data.uradmonitor.com/api/v1/devices/[ID]/[sensor]/[startinterval]/[stopinterval]
Method: HTTP GET		**Purpose**: data access
Description		ID is a unique uRADMonitor unit ID (eg. 110000AB) . Sensor is a sensor name (eg. temperature) or you can also use the special keywork "all" to access data from all sensors installed on the unit. Startinterval is the the number of seconds from the moment of the present to get data from; "stopinterval" is optional and it represents the number of seconds from the moment of present to get data to. If "stopinterval" is not specified, the moment of present is used as the stop point. If there is no data for the query specified, you will receive an empty JSON array.
Authentication		yes, using X-User-id and X-User-hash in HTTP Get header

Call example:



Return: For the previous example call, we receive two temperature measurements, because we specified an interval of 120 seconds and the unit resolution was 1 minute:

[{ **time :** "1500498412", **latitude :** "61.11200000", **longitude :** "-149.90440000", **altitude :** "250.00", **temperature :** "22.00"},
{ **time :** "1500498472", **latitude :** "61.11200000", **longitude :** "-149.90440000", **altitude :** "250.00", **temperature :** "21.93"}]

Additional information is presented under the API tab in the uRADMonitor dashboard:
https://www.uradmonitor.com/dashboard/