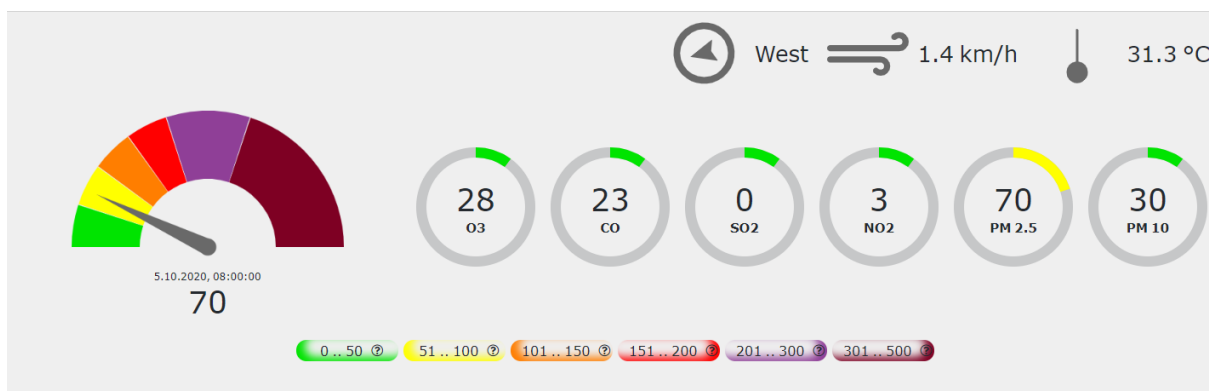


Recordum Air Quality Index

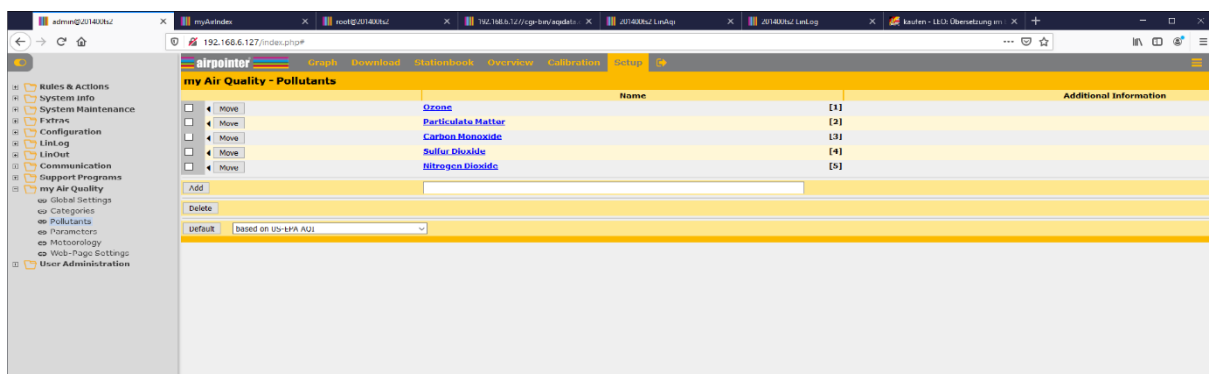
Interpreting ambient air quality data is not easy for the general public. To translate the different gas concentrations into an Air Quality Index makes it easier to understand. This Air Quality Index shows the air quality in a number of health related, color coded categories. Around the world different Air Quality Indexes are established, we have implemented Indexes based on US-EPA, European Air Quality Index but also a German Index definition "Der Luftqualitätsindex". These different Air Quality Indexes are implemented as default setups, preparing the calculation method and setup the parameters and limits needed. The user is able to adapt the setup to his needs. The Air Quality Index is shown as an html page on the airpointer. It is very easy to integrate this page in a frame of the organizations webpage. Additionally the Air Quality Index data can be polled from the airpointer as a JSON string if the data should be integrated in other webpages.



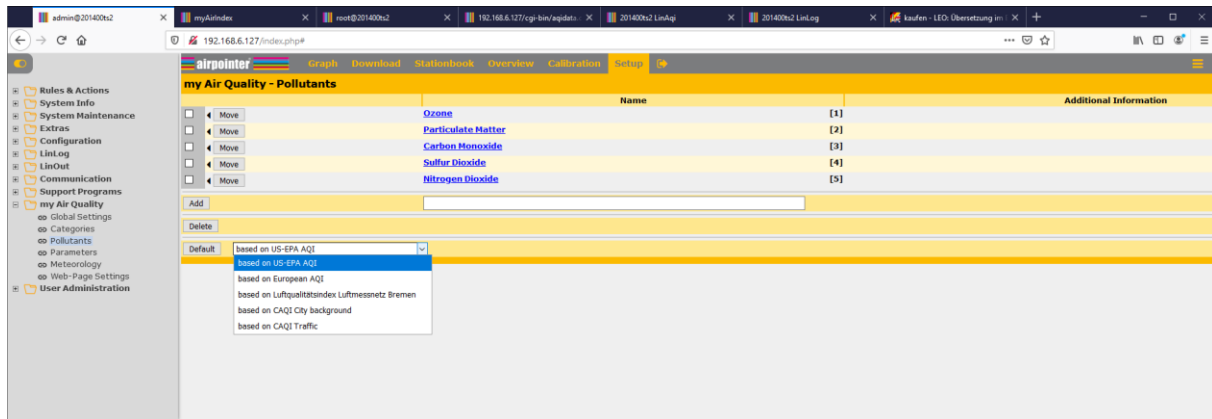
This Air Quality Index feature is available for the recordum airpointer and also for the recordum airQlog. It is a paid option, if you have not already purchased the option your distributor will be happy to give you an offer. The feature can be installed on all machine build after mid of 2013 or instruments that have an update to the actual software version.

Default Setup, Pollutants:

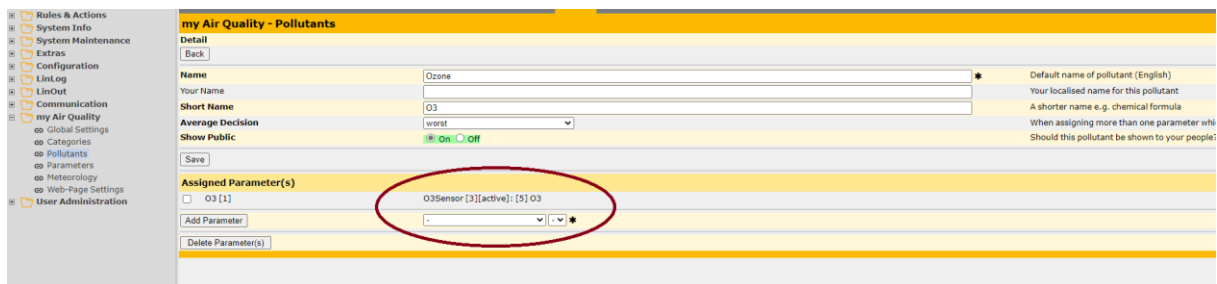
Log into with an Admin account and do a Software update, this update will enable the Air Quality Index feature. On the left hand menu chose my Air Quality and Pollutants.



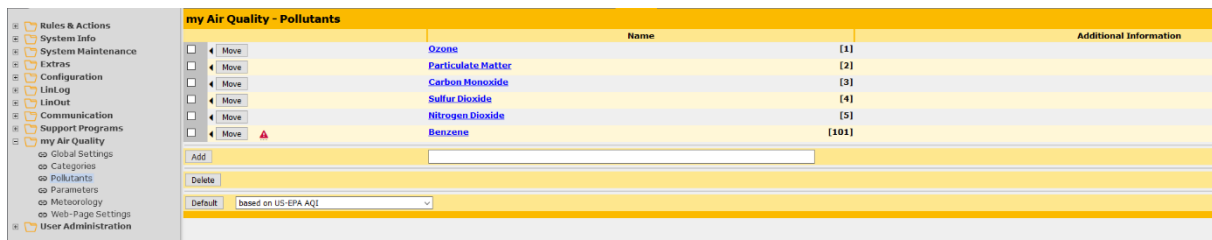
Now the most important configuration needs to be done, you need to choose on which standard your Air Quality Index should be based on.



The main difference is that US-EPA AQI is number orientated while on the European and German Index the resulting category is the main goal. After you have pressed <default> your choice is written to the database and the unit tries to find the according measuring parameter on the machine. Now it is time to check if the software find the right parameter. Click for example on Ozone and check the setup:



If no parameter is found automatically you can add the parameter manually. For some setups, like PM in US-EPA you can setup even more than one parameter to the pollutant. In case of PM it is PM2.5 and PM10. Most of the setup here is self-explaining, under <your Name> you can put in the translation of the parameter name. Repeat this step for all of your pollutants. If you don't want to use a pollutant or if this pollutant is not measured on the unit delete it by marking the checkbox next to the parameter and press delete. If you want to add a pollutant, type in a name in the field next to the <add> button and press <add> afterwards. In the example Benzene was added, the red warning sign shows you that you need to assign a parameter.



Categories:

It is time to have a look at the categories now:

my Air Quality - Categories		
	Name	Additional Information
<input checked="" type="checkbox"/>	Good	[1] 0 - 50 []
<input checked="" type="checkbox"/>	Moderate	[2] 51 - 100 []
<input checked="" type="checkbox"/>	Unhealthy for Sensitive Groups	[3] 101 - 150 []
<input checked="" type="checkbox"/>	Unhealthy	[4] 151 - 200 []
<input checked="" type="checkbox"/>	Very Unhealthy	[5] 201 - 300 []
<input checked="" type="checkbox"/>	Hazardous	[6] 301 - 500 []

These categories are look quite different depending on the default configuration:

my Air Quality - Categories		
	Name	
<input checked="" type="checkbox"/>	Good	[1] 0 - 50 []
<input checked="" type="checkbox"/>	Moderate	[2] 51 - 100 []
<input checked="" type="checkbox"/>	Unhealthy for Sensitive Groups	[3] 101 - 150 []
<input checked="" type="checkbox"/>	Unhealthy	[4] 151 - 200 []
<input checked="" type="checkbox"/>	Very Unhealthy	[5] 201 - 300 []
<input checked="" type="checkbox"/>	Hazardous	[6] 301 - 500 []

my Air Quality - Categories		
	Name	
<input checked="" type="checkbox"/>	Good	[1] 0 - 1 []
<input checked="" type="checkbox"/>	Fair	[2] 1 - 2 []
<input checked="" type="checkbox"/>	Moderate	[3] 2 - 3 []
<input checked="" type="checkbox"/>	Poor	[4] 3 - 4 []
<input checked="" type="checkbox"/>	Very poor	[5] 4 - 5 []
<input checked="" type="checkbox"/>	Extremely poor	[6] 5 - 6 []

Even it is quite strict defined for some Air Quality Index, you can modify each category by clicking on it.

my Air Quality - Categories			
Detail			
Back			
Color	<input type="text" value="#ff7f0e"/>		
From	101	Category applies from ... till	
Till	150		
Name	Unhealthy for Sensitive Groups	Default name of category (English)	
Your Name		Your localised name for this category	
Legend	<p>"Unhealthy for Sensitive Groups" AQI is 101 to 150. Although general public is not likely to be affected at this AQI range, people with lung disease, older adults and children are at a greater risk from exposure to ozone, whereas persons with heart and lung disease, older adults and children are at greater risk from the presence of particles in the air.</p>		The legend text
Save			

It is a very good idea to add a translation of the Name to <Your Name> to make sure local people understand the category. On <Legend> explain to the local people what the meaning of this category is and what they should avoid if this category is active.

Parameters

Having the Parameters added to the pollutants before, fine adjustments can be done and different averages can be added to that pollutant.

my Air Quality - Parameters		
Detail		
Back		
Name	<input type="text" value="O3"/>	Default name of parameter (English)
Gas Name	<input type="text" value="O3"/>	
Temperature	<input type="text" value="20"/>	Which temperature is used for Standard calcul
Method	<input type="text" value="EU"/>	Calculation method
Save		
Assigned Average(s)		
<p>Select an averaging method (sel_avg_type) and time frame (sel_time_span) that uses your unit (sel_unit). If your DB stores the parameter averages using a different unit, then tell us about it (sel_unit_db_values). Truncate (sel_truncate) the values and set the needed coverage (tbl_data_coverage) for a valid index. Finally select if the average is part of the final index decision or computational only.</p>		
<input type="checkbox"/>	arithmetic 60 min	<input type="button" value="Update"/> <input type="text" value="arithmetic mean"/> <input type="text" value="1 hour"/> <input type="text" value="µg/m³"/> <input type="text" value="ppb"/> <input type="text" value="0.001"/> <input type="text" value="75"/> <input type="button" value="On"/> <input type="button" value="Off"/>
<input type="button" value="Add Average"/>	<input type="text" value="none"/> <input type="text" value="30min"/> <input type="text" value="none"/> <input type="text" value="none"/> <input type="text" value="integer"/> <input type="text" value="75"/> <input type="button" value="On"/> <input type="button" value="Off"/>	
Delete Average(s)		

In the upper part the reference temperature needs to be chosen, with this setup the correct computation between units can be done. The other items on the upper part are self-explaining. But you need to know more about averages:

Averages

The assigned averages are the key to the different setups. For averages the 1 minute averages of the stored data, including coverage data are taken from the database for computing.

The several different kinds of averages needs to be explained:

Arithmetic mean:

The data for the actual averages are taken from the database and averaged according to number of 1 second values included into this average. At the end a coverage for the resulting average is computed.

Example: 3h average: We should find $3 \times 60 \times 60 = 10800$ one second values averaged together in total. If we find only 9005 values included the coverage of the 3h average is 83,4%. In most cases a coverage of 75% needed for a valid index, in our example we fulfill this need.

The arithmetic average is calculated when the actual time fits the interval. In the 3h average example it is:

00:00, 03:00, 06:00, 09:00, 12:00, 15:00, 18:00, 21:00,...

Moving average:

The calculation is done in the exact same way like above, but the moving average is calculated in the "Calculation Interval" defined in Global settings. In that way with a Calculation Interval of 60minutes, every hour a 24h moving average is calculated.

Moving average EN:

The calculation is done a bit different as above: In the European Union 1hour averages need to be build first including the coverage calculation. Depending of the coverage these 1h averages are set valid or invalid. Only valid 1hour averages are taking to compute the final moving average. If we have not enough 1h averages we cannot compute the index. Typically we need 75% of coverage, so at least 3 1h average out of four. This is the reason why only moving averages EN needs to have a duration of >4 hours.

Now Cast average:

The US EPA want to show Air Quality Indexes that is more presenting the actual situation than it is possible with 1day averages that are used. The new Method is call Now Cast, the idea behind is to take 24 1h averages and give them a different weight. If it is close to the actual time it is weighted much higher than the very first average. A precise description of this method can be found in the file "pm25_aqi_reporting_nowcast_overview.pdf" of the US-EPA.

The calculation interval is normally 1hour but it can be set in "NOWCast Interval" defined in Global settings.

Before adding a new average, you need to define the average type and it's duration. In most cases the unit the average is stored in the database is different to the unit the AQI is defined therefor the units must be defined too. For the US EPA it is mandatory to define the number of places behind the comma for correct calculation. The coverage needed for that average to be valid is the last edit field. With the last on/off selector you can chose if this average should be only calculated and stored or if this average should also be used to set Parameter index -> Pollution index -> Station index.

After adding the new average you will see a red warning triangle again. In this case we are missing the limit definition for that average.

You need to add the lower and upper limit of the concentration of this Parameter that represents that category.

This finishes the AQI parameter setup. It is a good idea to check the LinAqi log file for error messages. After that you can see how you index is computed in the Service Interface of LinAqi. Just add/cgi-bin/linaqi.cgi to the url of your machine.

STATION	based on US EPA Air Quality Index				INDEX for Station:	6	20201005 12:45:00	Station Index caused by Pollutants less than 3.0µm
POLLUTANT 1 Ozone					INDEX of Pollutant:	6	20201005 12:45:00	
PARAMETER 1 O3					INDEX of Parameter:	6	20201005 12:45:00	
Average Type	Time	Average (database unit)	Average (index unit)	Coverage	Data OK for Index calculation?	Index	Timestamp	used for Index calculation
Arithmetical Avg 1h	20201004 12:45:01 - 20201005 12:45:00	29.3 µg/m³	29.3 µg/m³	100.0%	Data OK	4	20201005 12:45:00	YES
Arithmetical Avg 8h	20201005 12:15:01 - 20201005 12:45:00	27.3 ppm	27 ppm	100.0%	Data OK	6	20201005 12:45:00	YES
POLLUTANT 2 Particulate Matter					INDEX of Pollutant:	2	20201005 12:45:00	
PARAMETER 1 PM2.5					INDEX of Parameter:	2	20201005 12:45:00	
Average Type	Time	Average (database unit)	Average (index unit)	Coverage	Data OK for Index calculation?	Index	Timestamp	used for Index calculation
Arithmetical Avg 1days	20201004 12:45:01 - 20201005 12:45:00	31.1 µg/m³	31.1 µg/m³	100.0%	Data OK	2	20201005 12:45:00	YES
PARAMETER 2 PM10					INDEX of Parameter:	28	20201005 00:00:00	
Average Type	Time	Average (database unit)	Average (index unit)	Coverage	Data OK for Index calculation?	Index	Timestamp	used for Index calculation
Arithmetical Avg 1days	20201004 00:00:01 - 20201005 00:00:00	30.4 µg/m³	30 µg/m³	100.0%	Data OK	28	20201005 00:00:00	YES
POLLUTANT 3 Carbon Monoxide					INDEX of Pollutant:	6	20201005 12:00:00	
PARAMETER 1 CO					INDEX of Parameter:	6	20201005 12:00:00	
Average Type	Time	Average (database unit)	Average (index unit)	Coverage	Data OK for Index calculation?	Index	Timestamp	used for Index calculation
Arithmetical Avg 8h	20201005 11:00:01 - 20201005 12:00:00	935.9 ppb	1780.148 µg/m³	100.0%	Data OK	6	20201005 12:00:00	YES
POLLUTANT 4 Sulfur Dioxide					INDEX of Pollutant:	1	20201005 12:00:00	
PARAMETER 1 SO2					INDEX of Parameter:	1	20201005 12:00:00	
Average Type	Time	Average (database unit)	Average (index unit)	Coverage	Data OK for Index calculation?	Index	Timestamp	used for Index calculation
Arithmetical Avg 1h	20201005 11:00:01 - 20201005 12:00:00	-1.9 ppb	-3.801 µg/m³	100.0%	Data OK	1	20201005 12:00:00	YES
Arithmetical Avg 1days	20201004 00:00:01 - 20201005 00:00:00	81.9 ppb	82 ppb	100.0%	Data OK	-	20201005 00:00:00	YES
POLLUTANT 5 Nitrogen Dioxide					INDEX of Pollutant:	1	20201005 12:00:00	
PARAMETER 1 NO2					INDEX of Parameter:	1	20201005 12:00:00	
Average Type	Time	Average (database unit)	Average (index unit)	Coverage	Data OK for Index calculation?	Index	Timestamp	used for Index calculation
Arithmetical Avg 1h	20201005 11:00:01 - 20201005 12:00:00	21.3 ppb	57 µg/m³	100.0%	Data OK	1	20201005 12:00:00	YES

(Please be aware that this are dummy data just for testing)

If you are a bit scared because of that big number of configuration possibilities, just startup with the according Default Setup. In most cases that is already the perfect setup!

Meteorology:

On most station also wind and other meteorological data are available you can use them to make your AQI page more informative.

Name	Additional Information
wind-direction	[1] Wind Dir - DummyAir [3][active] - ° [108930]
wind-speed	[2] Wind Speed - DummyAir [3][active] - m/sec [108924]
ambient-air-temperature	[3] Air Temp - DummyAir [3][active] - °C [108696]
ambient-air-pressure	[4] Amb Press - DummyAir [3][active] - mbar [108936]
ambient-air-humidity	[5] Humidity - DummyAir [3][active] - % [108942]

There are the 4 most usefully parameters predefined. Click on one to do your configuration:

The first switch is to turn the display on or off. On the next one you chose the average used.

On the Assign drop down choose the parameter that represents Wind Speed in that case and press assign. For some parameters you can chose the Unit the parameter should be presented.

Web-Page Setting

The Webpage displayed is widely configurable and self-explaining. Your can write your own text, how the AQI is computed and what does it mean yourself in your language. This not just a normal text, the format is called markdown. This makes it possible for you to make headers,

Element	Markdown Syntax
Heading	# H1 ## H2 ### H3
Bold	**bold text**
Italic	<i>*italicized text*</i>
Blockquote	> blockquote
Ordered List	1. First item 2. Second item 3. Third item

Element	Markdown Syntax
Unordered List	- First item - Second item - Third item
Code	`code`
Horizontal Rule	---
Link	[title](https://www.example.com)
Image	![alt text](image.jpg)

A detailed description you can find here: [Markdown Cheat Sheet](#) | [Markdown Guide](#)

Example how to integrate in a frame

With this simple HTML line you can integrate your airpointer AQI page into your own web page:

```
[iframe src="https://airpointer-2020-00723.recordum.net/aqi/?p=my_aq&layout=full"
width="100%" height="550" frameborder="0"]
```

See an example here: [AQI Example Site – tech support \(airpointer.tech\)](#)

JSON communication

The communication between the User Interface and LinAqi is done by a call and a responding JSON string. This Interface can be used for machine to machine communication if a webpage or similar should be fed with the ready calculated AQI.

We have just to commands aqiinfo.cgi and aqidata.cgi. With aqiinfo you can see what is available on that machine, with aqidata you can ask for data. You need to send the login information with the command otherwise you will not get a response.

The queries in my example (you need to define your user for communication):

https://192.168.6.127/cgi-bin/aqiinfo.cgi?loginstring=downuser&user_pw=1downUser23

That is the response of my testing station:

```
{
  "categories": [{
    "number": 1,
    "name": "Good",
    "translated": "",
    "color": "#00e400",
    "valid_above": 0,
    "valid_below": 50
  }, {
    "number": 2,
    "name": "Moderate",
    "translated": "",
    "color": "#ffff00",
    "valid_above": 51,
```

```

        "valid_below": 100
    }, {
        "number": 3,
        "name": "Unhealthy for Sensitive Groups",
        "translated": "",
        "color": "#ff7e00",
        "valid_above": 101,
        "valid_below": 150
    }, {
        "number": 4,
        "name": "Unhealthy",
        "translated": "",
        "color": "#ff0000",
        "valid_above": 151,
        "valid_below": 200
    }, {
        "number": 5,
        "name": "Very Unhealthy",
        "translated": "",
        "color": "#8f3f97",
        "valid_above": 201,
        "valid_below": 300
    }, {
        "number": 6,
        "name": "Hazardous",
        "translated": "",
        "color": "#7e0023",
        "valid_above": 301,
        "valid_below": 500
    }
  ],
  "pollutants": [
    {
      "number": 1,
      "name": "Ozone",
      "shortname": "O3"
    },
    {
      "number": 2,
      "name": "Particulate Matter",
      "shortname": "PM"
    },
    {
      "number": 3,
      "name": "Carbon Monoxide",
      "shortname": "CO"
    },
    {
      "number": 4,
      "name": "Sulfur Dioxide",
      "shortname": "SO2"
    },
    {
      "number": 5,
      "name": "Nitrogen Dioxide",
      "shortname": "NO2"
    }
  ],
  "meteorology": [
    {
      "number": 1,
      "name": "Wind Dir"
    },
    {
      "number": 2,
      "name": "Wind Speed"
    },
    {
      "number": 3,
      "name": "Air Temp"
    }
  ]
}

```

I think the identifier are self-explaining.

https://192.168.6.127/cgi-bin/aqidata.cgi?loginstring=downuser&user_pw=1downUser23

That is the response of my testing station:

```

{
  "station_index": 247,
  "station_name": "247-8"
}

```



```
"time_stamp": "2020-10-05T13:00:00+01:00",
"missing": 0,
"color": "#8f3f97",
"label": "Very Unhealthy",
"info": "Station Index caused by Nitrogen Dioxide",
"station_index_exceeded": 0,
"station_index_exceeded_msg": "",
"poll_index": [{
  "id": 1,
  "number": 1,
  "name": "Ozone",
  "shortname": "O3",
  "pollutant_index": 0,
  "category_pointer": 0.0,
  "time_stamp": "2020-10-05T13:00:00+01:00",
  "missing": 0,
  "color": "#00e400",
  "label": "Good",
  "info": ""
}, {
  "id": 2,
  "number": 2,
  "name": "Particulate Matter",
  "shortname": "PM",
  "pollutant_index": 84,
  "category_pointer": 84.0,
  "time_stamp": "2020-10-05T00:00:00+01:00",
  "missing": 0,
  "color": "#ffff00",
  "label": "Moderate",
  "info": ""
}, {
  "id": 3,
  "number": 3,
  "name": "Carbon Monoxide",
  "shortname": "CO",
  "pollutant_index": 70,
  "category_pointer": 70.0,
  "time_stamp": "2020-10-05T08:00:00+01:00",
  "missing": 0,
  "color": "#ffff00",
  "label": "Moderate",
  "info": ""
}, {
  "id": 4,
  "number": 4,
  "name": "Sulfur Dioxide",
  "shortname": "SO2",
  "pollutant_index": 27,
  "category_pointer": 27.0,
  "time_stamp": "2020-10-05T13:00:00+01:00",
  "missing": 0,
  "color": "#00e400",
  "label": "Good",
  "info": ""
}, {
  "id": 5,
  "number": 5,
  "name": "Nitrogen Dioxide",
  "shortname": "NO2",
  "pollutant_index": 247,
  "category_pointer": 247.0,
  "time_stamp": "2020-10-05T13:00:00+01:00",
  "missing": 0,
  "color": "#8f3f97",
  "label": "Very Unhealthy",
  "info": ""
}],
"meteorology": [{
  "id": 1,
  "number": 1,
  "name": "Wind Dir",
  "time_stamp": "2020-10-05T13:00:00+01:00",
```

```
        "value": 1.5,  
        "unit": "Â°",  
        "missing": 0  
    }, {  
        "id": 2,  
        "number": 2,  
        "name": "Wind Speed",  
        "time_stamp": "2020-10-05T13:30:00+01:00",  
        "value": 1.3,  
        "unit": "km/h",  
        "missing": 0  
    }, {  
        "id": 3,  
        "number": 3,  
        "name": "Air Temp",  
        "time_stamp": "2020-10-05T13:30:00+01:00",  
        "value": 48.1,  
        "unit": "Â°F",  
        "missing": 0  
    }  
}
```

Luckely this are test data only ☺