Optical Sensors Sweden AB

Manual for MiniPWS

MiniPWS is a low price sensor for **visibility and precipitation**. The performance is not as good as for our Air eye but it will work fine for many applications.

The sensor is heated to a few degrees above ambient temperature in order to keep moisture away from the lenses.
In order to keep the electronics dry a membrane ventilator that keeps the pressure inside at the same level as outside. This prevents liquid water from sucking into the sensor through micro cracks etc at falling temperature – a creative solution to a big problem.

The sensor produces digital signals:

About the RS232 output:

The calculated data is presented in digital form as an ASCII string on the RS232 output, 2400 baud 8N1, that is transmitted "streaming" every minute. The precipitation data is however“rolling means of the last 5 minutes. This string can be received by many loggers with RS232 inputs but also by a PC with a terminal program like Hyper Terminal (part of WINDOWS).or a freeware called “Br@y terminal”, via serial port or USB port combined with a cheap RS232 to USB converter.

This is an example of an output string:

09:24:16> 0.00196 01530 0.00000 0.21100 0.00000 -00006 000120 71

The number before the “>” character is a time stamp made by the terminal program used.
The **second** number - in this case 0.00196 - is the extinction coefficient often called alfa. The relation between the extinction, alfa and visibility, VIS, is alfa=3/VIS. The alfa parameter can be used for monitoring trends in visibility when the visibility is larger than 5000 meters. But note that the absolute accuracy in alfa is limited in such cases.
The **third** number is the measured visibility in meters, if the measured visibility is larger than 5000 meters 05000 is displayed.
The **fourth** number is a measure of the rain precipitation in mm/h during the last 5 minutes.
The **fifth** number is the same for snow.
The **sixth** number is the same for mixed precipitation.
The **seventh** number is the temperature inside the sensor casing. The accuracy of this number as a measure of the ambient temperature is something like ± 3 degrees or even higher during sunlight.
The **eighth** number is an uncalibrated measure of the ambient solar irradiance. The sensitivity depends stongly on how the sensor is aimed. It may vary considerably. But the the repitivity is much better and the offset error is only ± 2 units. The sensor can, when mounted, be individually calibrated by comparing it with an irradiance sensor. But a simple method is to take data from a clear day at noon. If the sun is 60 deg or more above the horizon the irradiance is not far from 1000 W/m2. The measurement is not very accurate- but it may be useful for instance for telling if it is day or night.

The **ninth** number in the data string is WMO codes.
00 is for good visibility, no precipitation
10 is for light fog, visibility between 3000 and 1000 meters
30 is moderate fog, visibility < 1000 meters
61 is for light rain
62 is for moderate rain
63 is for heavy rain
68 is for light intensity of mixture of rain and snow, not fully tested
69 is for light intensity of moderate or heavy mixture of rain and snow, not fully tested
71 is for light snowfall
72 is for moderate snowfall
73 is for heavy snowfall

Some short data of the MiniPWS sensor:

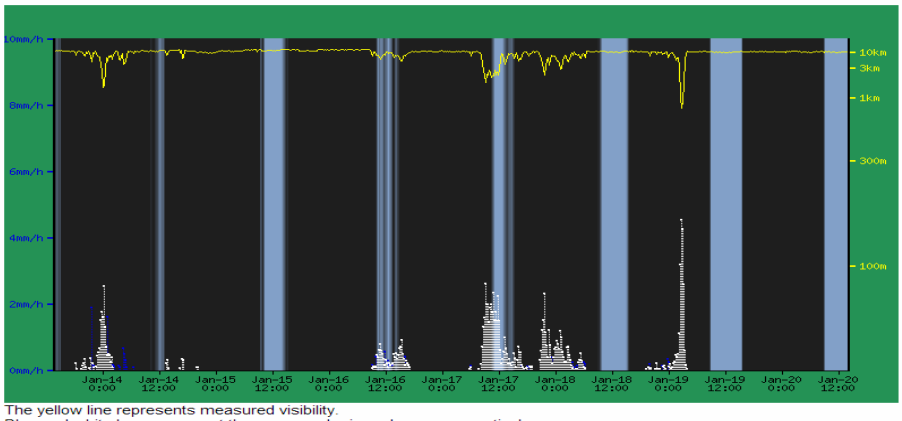
Dimensions:	68*45*34 mm, for details see drawing
Weight	about 170 grams
Warm up time	about 1 minute
Current consumption	About 14 mA from a 12 Volt (8-14) supply
Output:	Digital RS232, 2400 baud 8N1
Update time:	1 minute*
Warmup time:	5 minutes*
Temp. range:	-20 to +50 deg C
Optical output power	About 1.5 mW from an IR VCSEL laser - eye safe, laser safety class 1 M
Wavelength:	980nm
Housing:	Anodized aluminum, openings sealed with O-rings.
Visibility range:	Visibilities from 5 km – down to 10 meters

**The precipitation data is "rolling means of the last 5 m*inutes.

Below here is data taken from a MiniPWS sensor in graphical form.

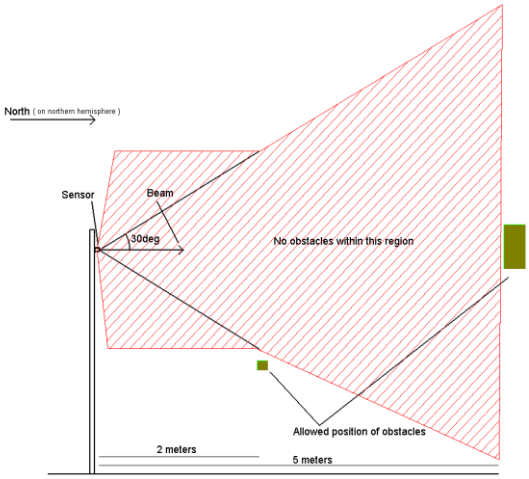
Present Weather in Göteborg - data from MiniPWS sensor.

1 day - **7 days**



The yellow line represents measured visibility.
Blue and white bars represent the measured rain and snow respectively.
Blue / black background represents day and night (measured light).

Mounting.



The sensor should be mounted so that it "looks" horizontal and roughly north (south on the southern hemisphere) – minimizing sunlight into receiver. There must not be anything in the sightline closer than 3 to 6 meters. Outside a cone of about 30 degrees angle objects can be tolerated at down to about 1 meter.

The outer dimensions are 68*45*34 mm.
We deliver a mounting bracket –seen in picture above - made of PMMA plastic. The picture shows our solution for mounting on a vertical 42 mm dia. tube. The sensor is electrically isolated when using this mounting bracket.

Mounting too near a wall or a roof of a building is not recommended. The reason is that the air near a building is a little warmer than some meters away from it. And in the warmer air the small “drops” will evaporate resulting in a higher measured visibility not representative for the visibility in the area.

The sensor is delivered with a 6 meter 4-wire cable connected.
The wire colors are chosen as follows:

red	12 Volt DC Power in
blue	Power ground
yellow	Signal ground
green	Digital signal out