Manual for MiniBSV

MiniBSV is a low price fog sensor. It will work fine for many applications like multi sensor for warning systems.

The sensor is sensitive for fog particles in a zone about 10 to 20 cm ahead of the location of the sensor who limit the visibility in the air. These particles are normally the microscopic water particles constituting fog, but they may also be snowflakes, raindrops or air pollutants. But the most indications of low visibility are because of fog or snow.

The sensor is heated to a few degrees above ambient temperature in order to keep moisture away. 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 analog and digital signals:

About the analog output:

The microprocessor controls the analog output giving the visibility directly (vis=1000 meters gives 1 Volt, and vis=0500 meters gives 0.5 Volt etc. up to 4 Volt at 4000 meters by 20mV steps). While temporal measurement errors such as sensor saturations by sunlight or reflections from an object it the sensitive zone like an insect of fallen snow covering the front, the sensor outputs 5 Volt as an error code. The analog output is refreshed at each every 30 seconds after once the voltage is dropped to 0 volt.

About the digital output:

We recommend this digital output since more and better information can be taken from it. The calculated data is presented in digital form as an ASCII string on the RS232output, 1200 baud 8N1, that is transmitted “streaming” every 30 seconds the fixed length data. This string can be received by many loggers with RS232 inputs but also by a PC via the serial port and with a terminal program like TeraTerm.

An example of an output string:

amb=+100 alfa=+0.0012 vis=2500

The first figure – the amb parameter is uncalibrated measure of the ambient solar irradiance in W/m2. The sensitivity depends strongly on how the sensor is aimed. It may vary as much as -50 to +100%. But the repeatability is much better and the offset error between units is only +/- 2. The sensor can, when mounted, be 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 second figure is the so-called extinction coefficient often called alfa. The relation between the extinction and visibility is alfa=3/VIS.* The alfa parameter can be used for monitoring trends in visibility when the visibility is larger than 4,000 meters. But note that the absolute accuracy in alfa is limited in such cases.

The third figure – the vis parameter – is the measured visibility in meters.

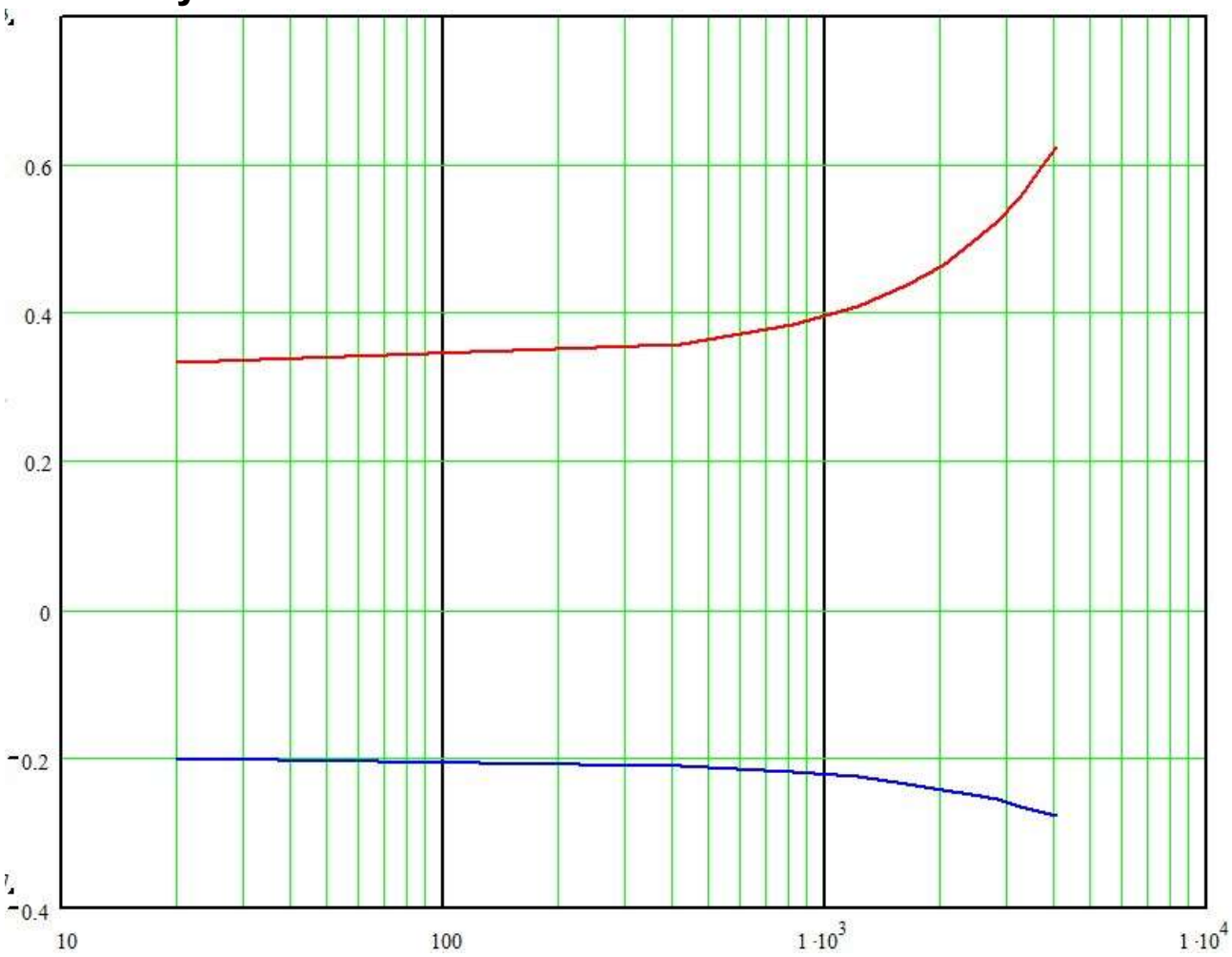
If the optical receiver is saturated by for instance sunlight or reflections from an object in the sensitive zone like an insect or fallen snow covering the front, the visibility displayed visibility value will be 5000 and the output can be:

amb=+050 alfa=+0.0000 vis=5000

Some short data of the MiniBSV

Dimensions（W*D*H）	68*34*45 mm
Weight	About 170 g
Warm up time	About 1 minute
Current consumption	<50 mA DC12 Volt (8-14)
Outputs	Analog 0-5 V, Digital RS232
Update time	30 seconds
Operation Temp. range	-20 to +50 ℃
Optical output power	About 3 mW (NIR LED) eye safe, class 1 M
Wavelength	850nm
Housing	Anodized aluminum, opening sealed with -rings
Visibility range	20m – 4,000m

Relative maximal error for MiniBSV visibility sensor versus visibility

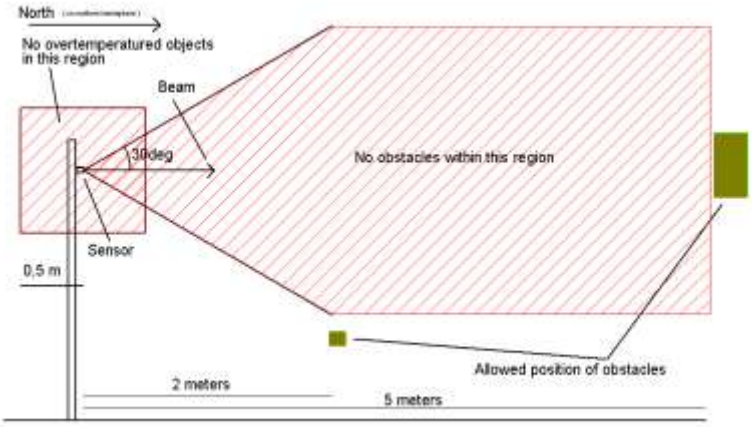


Example1:
When the visibility is 100 meters the error may vary from +0.35 to -0.21,
which means that the displayed result may vary between 79 to 135 meters.

Example2:
When the visibility is 1000 meters the error may vary from +0.4 to -0.22,
which means that the displayed result may vary between 780 to 1400 meters.

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 5 to 10 meters. Outside a cone of about 30 degrees angle objects can be tolerated at down to 2 about meter. See figure below.



The outer dimensions are 68*45*34 mm and the four M3 holes for fastening are located on the top surface on a centered rectangle 14*51 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 on a wall or too near to 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 5-wire cable connected. The wire colors are chosen as follows:

red	12 Volt DC Power in	
black	Power ground	
white	Signal ground	
green	Digital signal out	
yellow	Analog out	